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ABSTRACT

This Bulletin, published bi-monthly, reports the current literature in the areas of science, engineering, technology, and public policy. The coverage encompasses both "policy for science" and "science for policy" matters. The bulletin is intended for individuals engaged in studying, formulating, or implementing public policy relating to science and its use. The purpose is to aid such individuals by alerting them to new additions to the science policy literature. The information presented consists primarily of a bibliographic listing of current publications in the area, together with an abstract of each publication. The bibliographic information is presented under a number of topical categories. The categories are (1) general, (2) science, domestic problems, and national goals, (3) needs and allocation of resources for science, (4) national R and D programs, (5) science, education, and the university, (6) science management and policy-making bodies, (7) science, foreign affairs, and national defense, and (8) science policy in foreign countries. Each cited publication is recorded under a single category; cross indexing is not used. The numbering of publications under each category runs consecutively through all issues of the Bulletin, so that a given number refers to only one citation. (LC)

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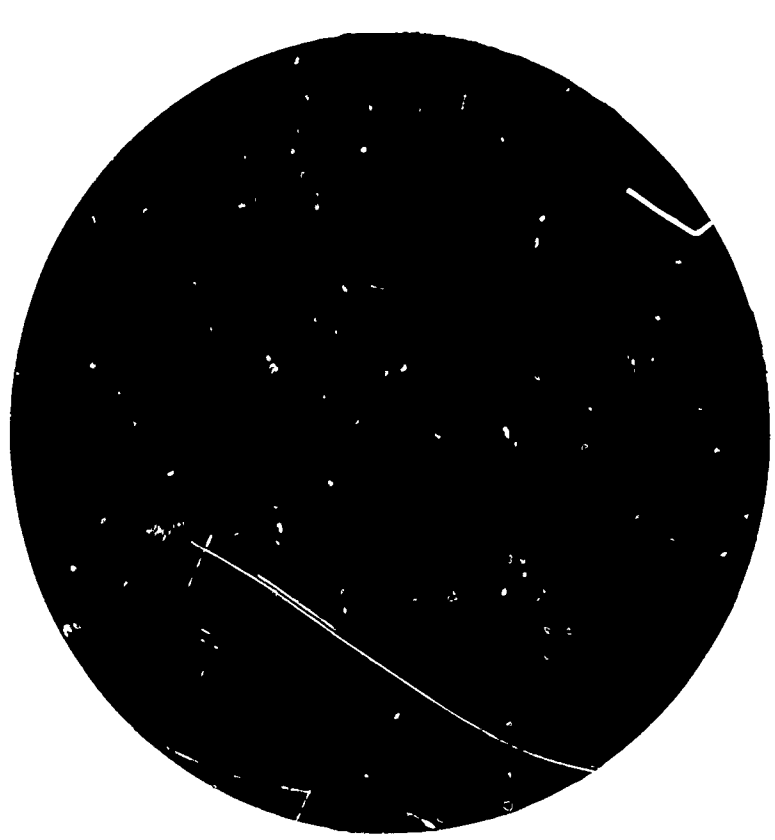

Science Policy Bulletin

Battelle Memorial Institute

SCIENCE POLICY BULLETIN

The Bulletin, published bimonthly, reports the current literature in the area of science and public policy. The coverage encompasses both "policy for science" and "science for policy" matters. For brevity, "science" is used to denote engineering, technology, and science.

The Bulletin is intended for individuals engaged in studying, formulating, or implementing public policy relating to science and its use. The purpose of the Bulletin is to aid such individuals by alerting them to new additions to the science policy literature.

The information presented in the Bulletin consists principally of a bibliographic listing of current publications in the area. In addition, major meetings and other events in the subject area are reported.

The bibliography, although covering a broad topical scope, is selective in that publications of a highly technical and narrowly specialized nature are excluded.

The bibliographic information is presented under a number of topical categories. Each cited publication is recorded under a single category; cross indexing is not used. The numbering of publications under each category runs consecutively through all issues of the Bulletin, so that a given number refers to only one citation.

Copies of the listed publications are not available through Battelle but can normally be obtained from the originating agency.

The contribution of information to the Bulletin as well as suggestions and comments on its content, coverage, and format are solicited. All correspondence should be addressed to:

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BIBLIOGRAPHY

I GENERAL

64. Platt, J., "What We Must Do", Science, v. 166, no. 3909, 28 November 1969, pp. 1115-1121.

The crises problems, both national and international, are discussed and approaches and mechanisms for their solution are suggested. The author presents charts that identify "the different problem areas according to some measures of their magnitude and urgency", so as to suggest priorities; the most urgent of these include nuclear war, famine, ecological crises, group and racial conflict, and administrative management of communities and cities. To cope with such problems massive social R&D is needed, which will "require something very similar to the mobilization of scientists for solving crises problems in wartime". "We need...interdisciplinary teams combining men of different specialties...who can pull together our stores of knowledge and powerful new ideas into improved technical methods, organizational designs, or 'social inventions' that have a chance of being adopted soon enough and widely enough to be effective". Task forces, in this approach, would focus their efforts on areas such as peace-keeping mechanisms, biotechnology (food sources and population control), game theory (to deal with group conflict and cooperation), psychological and social theories, and social indicators.

65. McElroy, W. D., "Bewildering Questions for Science in the 1970s", News Report, National Academy of Sciences, National Research Council, National Academy of Engineering, v. XIX, no. 9, November 1969, pp. 8-9.

In this address to the autumn meeting of the National Academy of Sciences, National Science Foundation Director McElroy discusses some key issues and questions confronting U.S. science including the role of science in social problems, the needs of academy science, public communication, and the responsibility of science to society. McElroy suggests that "the solution of social problems will be tied to a significant degree to science and technology"; to ensure that science preserves "its integrity in such a coupling needs careful leadership". For improving the condition of academic science, he calls for increased funding and leadership by the NSF. Special attention, with

some suggested mechanisms, is given to the need for improving the communication between the scientific community and the public. In connection with social responsibility, he notes that science cannot be justified by the material benefits that flow from it, while rejecting responsibility for the destructive side effects of technology; "the responsibility we scientists ought to feel for technological effects is grounded not only in logic but in self-interest".

66. Crowe, B. L., "The Tragedy of the Commons Revisited", Science, v. 166, no. 3909, 28 November 1969, pp. 1103-1107.

The prospects for obtaining political and social solutions to critical problems - population, atomic war, and environmental corruption - are examined and suggestions are offered for how science can contribute to their solution. Political and social solutions, the author contends, cannot be expected because of "structural as well as value problems"; the latter center around the lack of common social values, the loss by the state of its "coercive force", and the failure of administrative devices to perform in accord with the public good. The author believes that "science has some interim contributions to make to the alleviation" of these problems, but that it presently is not doing so. This failure is attributed to the existence of "two insular scientific communities - the natural and the social - between which there is very little communication and a great deal of envy, suspicion, disdain, and competition for scarce resources". Using the English commons as an analogical context, the author suggests that science can contribute by providing "technological responses which at once alleviate those problems and reward those people who no longer desecrate the commons", and by "maintaining, controlling, and disseminating" information regarding the state of the overall environment. But, "[n]either of these contributions...will be made by science unless there is a significant break in the insularity of the two scientific tribes".

67. Kantrowitz, A., "The Test: Meeting the Challenge of New Technology", Bulletin of the Atomic Scientists, v. 25, no. 9, November 1969, pp. 20-24, 48.

The revolution caused by the union of science and technology is now threatened, according to the author, by a massive counterattack driven "by real and justified fears of its power and consequences, and, perhaps still more, of its unpredictability and the present lack of control over it". This counterattack is viewed as a test of our society: "will we - and can we - take action to meet the very real problems that are raised by this enormous power, or will we attempt to escape that responsibility?" Although the

author does not offer "a prescription for meeting this challenge", he suggests that "democratic control of our "rapidly advancing technology" is urgently needed. Toward this end, he describes several problems of scientific advisory committees, which generally link the scientific and political communities, and suggests the "creation of a body of scientist judges to weigh the evidence in scientific debates on decisions where no scientific unanimity exists and which hold political and moral implications". Specifically, he recommends separating the scientific from the political and moral components of such decisions, separating judge and advocate roles, and publishing the scientific judgments reached. These ideas for achieving democratic control are "in direct opposition to the idea of the 'moral responsibility of scientists', a modern form of noblesse oblige". But, unless such control is achieved, "a deep and widespread fear of technology will soon threaten our position vis-a-vis the Soviet Union and destroy our vision of a better society".

68. "Sombre Greeting From Abroad", Nature, v. 224, no. 5226, 27 December 1969, p. 1250.

Dr. Philip Handler, president of the U.S. National Academy of Sciences, speaking at the Biochemical Society in London, "warned his British colleagues against some of the dangers which were now apparent in the United States". He pointed out that "at the very height of scientific success...we are experiencing a violent world reaction" against science and technology. He further emphasized that "science has taken into account the less wise aspects of its use for the existence of nuclear, chemical and biochemical weapons for contamination of air, earth, water and food, while its enormous contributions to human welfare seem all too easily to go forgotten". Among the dangers he describes are the decline in federal appropriations for fundamental research and overemphasis on applied research, the disenchantment with science expressed by youth, the pressure "to convert great universities into mere teaching factories" at the expense of research, and the failure to strengthen the National Science Foundation, "whose mission it is to strengthen science itself across the land".

69. Cohn, V., "Who Needs Science? See Your Congressman", Technology Review, v. 72, no. 2, December 1969, pp. 8-9.

"American science today faces its toughest job in the last 25 years: persuading America to support science". The financial crises in science and science education is illustrated by examples and statistics, and an appeal is made to scientists to become politically active in reversing this trend. "Total research and training, in terms of

real effort, could soon be down 40 per cent since fiscal 1967"; "fiscal 1970 will certainly be the worst of four straight years in which research and education funds have either been held level or cut". On the other hand, the "country will need new armies of experts...to attack pollution, man universities, and build new urban and industrial technologies. Present federal policies will not provide them". Noting that "[p]ower in Washington is based on having a constituent or electorate behind you, having votes", the author asks: "Are scientists willing to leave their laboratories to tell the country this story?"

70. Szent-Gyorgyi, A., "Science and Budget Cutting", Bulletin of the Atomic Scientists, v. 25, no. 10, December 1969, pp. 16-17.

The author, a Nobel laureate in medicine, discusses "the effect of the budget cuts on science" in the U.S. and their causes. Budget cuts "have a disrupting and demoralizing effect, and the damage already effected is out of proportion with the economy desired. These cuts have damaged not only the present, they have also jeopardized the future, shutting the way to science for many young men and destroying their confidence in a scientific career. This deterioration of science is not an isolated phenomenon: it is part of a wider process". As for the causes of the budget cuts, as well as for the "wider calamity" of which such cuts are only a part, the author believes "there is one factor which...stands out sharply": the military establishment. When "an army exceeds a critical mass, it becomes the master of civil authorities instead of being their servant; it directs their foreign policy and the distribution of resources". The use of scientific knowledge by the military has also caused "the revulsion against science", according to the author.

71. "A Center Report/Man's Doing and Undoing", The Center Magazine, v. II, no. 6, November 1969, pp. 33-49.

This report is based on a week-long conference, held at the Center for the Study of Democratic Institutions, on the implications of biology and "its technological fallout in the environmental and ecological order". The conference was organized around three questions: "What is the biological revolution? What are the main problems created by or associated with the biological revolution? What are some of the things that might be done to meet these problems?" Among the topics discussed were the nature and dimensions of the "biological revolution", medical ethics, assessment of technology and science, environment and the law, and the differences between science and technology as they relate to necessary "controls". Among the individual statements and recommendations made at the conference were a proposed amendment to the Constitution in the form of an 'Environment Bill of Rights', creation of

a new independent agency for technology assessment, and establishment of state councils with authority to protect the environment.

72. Langrish, J., "Does Industry Need Science?", Science Journal, v. 5A, no. 6, December 1969, pp. 81-84.

It is generally assumed that economic growth is promoted by scientific research, and that the time gap between new scientific discoveries and their application is narrowing. The validity of both assumptions is questioned by the author. With respect to the first assumption, Langrish notes that economic growth in the United Kingdom has been slow in spite of large investments in science, that industrial advances often come before scientific discoveries, and that "many industrial innovations are part of a continuing process of change...and the connection of this change with science is rather obscure". An alternative view, frequently expressed in industry, that "need comes first" is rejected also as "too simple". As for the decreasing time lag between discovery and application, the author criticizes previous studies on several grounds and presents various examples that invalidate this assumption. The implications for support of pure science, that follow from the rejection of these assumptions, are briefly discussed, and suggestions to justify the financing of science are offered. The author concludes that industry "needs science, but for different reasons than it needed it in the past. What industry needs is not so much the new discoveries and new knowledge produced by pure science, but the people who have absorbed the condensed accumulation of past science which can be brought to bear on the problems of industry".

73. "The Process of Technological Innovation", Symposium Sponsored by the National Academy of Engineering, 24 April 1968, National Academy of Sciences, 1969, 103 pp.

This symposium examines factors involved in and essential to successful technological innovation. The topic "technological innovation" is used in its broadest sense to include research, development, design, manufacturing, marketing, customer service, and the relation of these to the total environment. The following papers are included: "Innovation in a Large Company", which is described as more process-oriented than product-oriented; "Basic Science as a Source of Innovation, and Vice Versa", which presents examples of innovations that grew out of basic research; "The Case History of the Research on the Stirling Cycle", which illustrates how technological innovation has been used in a specific instance; "Some Factors Inhibiting Technological Innovation in France", which describes the role of

government in promoting a favorable environment for industrial innovation; "Technological Thresholds", which treats certain economic considerations concerning innovation; "Process of Some Technological Innovations in Telecommunications and Electronics in Japan", which deals with the development of Japanese technology in these sectors; and "Innovation and the Private Enterprise System in the United States", which describes policies, practices, and problems of technological innovation in the U.S.

(This report is available from the Printing and Publishing Office, National Academy of Sciences, 2101 Constitution Avenue, Washington, D.C. 20418.)

74. Technology and the Polity, Research Review No. 4, Harvard University, Program on Technology and Society, 61 Kirkland Street, Cambridge, Massachusetts 02148, Summer 1969, 53 pp.

This report deals with "the impact of technological change on the American political structure". To provide an appreciation of the literature in this particular area, "lengthy abstracts of a small number of carefully selected books and articles are presented, preceded by a brief state-of-the-art essay and by summary statements covering each subcategory of titles". The topics selected for review are: technological change and democratic theory and practice; expertise and policy-making process; information systems, data banks, and privacy; using and controlling technology for public purposes; and decision-making techniques: system analysis and planning-programming-and-budgeting.

(This report can be obtained from the Harvard University Press, 79 Garden Street, Cambridge, Massachusetts 02138, Price: $2.00.)

75. Caldwell, L. K. (Ed.), "Science, Technology, and Public Policy: A Selected and Annotated Bibliography", Volume II, Prepared for the National Science Foundation by the Program of Advanced Studies in Science, Technology, and Society, Department of Government, Indiana University, Bloomington, Indiana, 1969, 544 pp.

"This volume lists and where necessary annotates some 2,700 articles selected from 50 periodicals...published in English for the period 1945 through 1967". As with Volume I (which cited books, monographs, and government documents), the compilation focuses upon public affairs and public policies in relation to science and technology. The bibliography is organized around the following topical headings: Philosophy of Science and Technology; History of Science and Technology; Nature and Impact of Science and Technology; Science, Government, and Public Institutions; Legal Aspects of Science and Technology; Education and Public Understanding

of Science; Scientific and Technical Personnel; International Scientific and Technical Cooperation; Organization and Management of Research and Development; Science and Culture: Humanities, Ethics-Religion; and Science and Society. An author-title index is included. (Volume I of the bibliography was cited in the Science Policy Bulletin, v. 1, no. 4, April 1968, p. 10.)

76. "Program of Policy Studies in Science and Technology Report", 1968-69, The George Washington University, Washington, D.C., 64 pp.

The program - initiated in 1966 and funded by the University, government, and industry - focuses on "the structure and functions of institutions designed to stimulate, utilize, regulate, and appraise the application of science and technology to the achievement of basic community goals" and more recently on "the application of modern R&D management concepts and skills to the planning, programming, and managing of governmental programs and urban social problem areas". This report presents an overview of the program's activities over the preceding three years and outlines the prospective program activities for 1969-70. Prospective areas of inquiry include new institutional arrangements for implementing and controlling advancing technology, the application of technological resources to national and international social needs, and technology assessment (identification and evaluation of the social impacts of technological applications). Included in the appendices are lists of participants in seminars held during the year and of program publications currently available.

(This report can be obtained from the Program of Policy Studies in Science and Technology, The George Washington University, Washington, D.C. 20006.)

77. "Harvard University Program on Technology and Society: Fifth Annual Report 1968-1969", Harvard University, Cambridge, Massachusetts, 1969, 82 pp.

The Harvard program "was established in 1964 by a grant from the International Business Machines Corporation to undertake an inquiry in depth into the effects of technological change on the economy, on public policies, and on the character of society, as well as into the reciprocal effects of social progress on the nature, dimension, and directions of scientific and technological developments". The program, as now formulated, concentrates on "the effect of technological change on (a) the life of the individual, (b) social and individual values, (c) the political organization of society, and (d) the structure and processes of social institutions". Current and planned activities in these areas are described; projects include "Work,

Careers, and Leisure Styles", "Technology, Work, and Character", "Technology and Religion", "Technology and Its Critics", "The Social Response to Biomedical Technology", "Information Technology and Public Decision-Making", "System Analysis for Urban Management", "Technology Assessment and the Law", "Structural Changes in the American Economy", "Technology, Social Policy, and the Role of the Business Firm", and "Social Innovation in the City".

(Copies of this report can be obtained by writing to the Harvard University Program on Technology and Society, 61 Kirkland Street, Cambridge, Massachusetts 02138. Single copies will be sent free of charge. For bulk orders the price is $1.00 per copy.)

II SCIENCE, DOMESTIC PROBLEMS, AND NATIONAL GOALS

58. "Interdisciplinary Research Relevant to Problems of Our Society", Notice No. 24, National Science Foundation, 11 December 1969, 2 pp.

The National Science Foundation has established a new program of support for scientific research in social problems. This notice provides background information regarding the new program, and indicates the kinds of problem areas that are eligible for support and the types of support available. "The primary emphasis in this program will be upon the support of comprehensive projects organized around a particular goal". "Systematic approaches to elements of such problem areas as poverty, population control, the urban environment and environmental quality are desired. This research should be designed to contribute to such objectives as assessment of technology, environmental management and control, and the optimal development of the nation's human and economic resources". In addition to the support of "comprehensive projects", funds "will also be available for exploratory research and planning, and for supporting the growth and development of interdisciplinary groups that have not yet initiated a coherent program".

(For further information, write the National Science Foundation, Office of Interdisciplinary Research, Washington, D.C. 20550.)

59. "A Strategic Approach to Urban Research and Development, Social and Behavioral Sciences Consideration", Report of the Committee on Social and Behavioral Sciences, National Research Council to the Department of Housing and Urban Development, National Academy of Sciences, 1969, 100 pp.

This report, prepared for the Department of Housing and Urban Development (HUD), presents advice and recommendations on "those social, economic, and institutional factors which affect the selection, introduction, and use of new techniques and programs to meet the social needs of the day and which underlie the emerging requirements and needs of tomorrow". Separate sections of the report deal with R&D strategy and management, recommendations for R&D programs, and urban information systems. Recommendations of the committee include (1) improvement and enlargement of HUD's inhouse R&D capability, (2) HUD support of basic research in the behavioral and social sciences and university urban institutes, (3) utilization of non-academic private R&D capabilities, (4) creation of Municipal Development Centers "to discover the most effective means for strengthening research capabilities in municipal governments", (5) greater emphasis on policy analysis and program evaluation within HUD, (6) creation of an Office of Information Management, and (7) suggestions for several specific R&D programs in such areas as information needs, implementation obstacles,

and systems research for identifying the "parameters and interacting properties of urban units".

(This report is available from the Printing and Publishing Office, National Academy of Sciences, 2101 Constitution Avenue, Washington, D.C. 20418.)

60. "Long-Range Planning for Urban Research and Development, Technological Considerations", Report of the Committee on Urban Technology, National Research Council to the Department of Housing and Urban Development, National Academy of Sciences, 1969, 94 pp.

This report, prepared for the Department of Housing and Urban Development (HUD), presents recommendations for defining urban problems, mobilizing capabilities, and effecting new approaches to the problems of housing and urban affairs. Sections of the report deal with R&D strategies, R&D resources and capabilities, technology in the urban environment, and housing and public facilities and services. The Committee concluded that resources from all sectors of our society must be brought to bear on urban problems and that "national goals be developed and quantified where possible" to guide and coordinate present efforts towards urban development. Recommendations of the Committee include (1) annual doubling of R&D effort over the next three years, (2) "continuous evaluation of the results of urban-technology programs"; (3) creation of a structure for the analysis of urban problems; (4) establishment of an information service for correlating and disseminating data from urban research; (5) examination of unsolicited proposals, and (6) correlation of responsibilities of all federal agencies concerned with urban research.

(This report is available from the Printing and Publishing Office, National Academy of Sciences, 2101 Constitution Avenue, Washington, D.C. 20418.)

61. Scheiber, W., "An Urbanist's Pessimism", News Report, National Academy of Sciences, National Research Council, National Academy of Engineering, v. XIX, no. 8, October 1969, pp. 8-9.

The author reviews two major National Research Council reports on urban R&D and reflects upon both the reports and the context in which they were prepared and delivered to the U.S. Department of Housing and Urban Development (HUD). (These reports, "A Strategic Approach to Urban Research and Development" and "Long-Range Planning for Urban Research and Development", are cited above.) "Sadly, neither of the two documents is likely to have a visible impact on the policy of HUD, or, for that matter, on any other part of the Federal Government". "[N]one of our recent national administrations has shown an interest in or commitment to

research into the country's...domestic difficulties". "The emphasis is on action programs and on fast, tangible pay-offs". The reports will wind up "on the shelves of obscure libraries beside similar reports exhorting similar action on the problems of our cities". "For the local officials... this prospect can only confirm his skepticism about the true interest of the Federal Government in coming to grips with the problems of its urban areas". Whether "the fruits of all this research [suggested in the two reports] are actually to be applied...is dependent on the state of our political process. Perhaps, then, our research should begin with the study of the American electorate itself, its aspirations, its fears, its willingness to pay the price of change".

62. Jones, E. M., "Systems Approaches to Socio-Economic Problems Confronting Governments: An Appraisal", Reprinted from the Emory Law School, Journal of Public Law, v. 18, no. 1, Program of Policy Studies in Science and Technology, The George Washington University, June 1969, 60 pp.

The relevance and potential contributions of systems analysis to the study and solution of socio-economic problems is discussed and appraised. In the appraisal, "three overlapping sets of criteria are employed. One set of criteria...is a general theory of the policy components of decisional outcomes of legal processes. The second...constitutes standards for evaluating the performance of the intelligence function of legal process. The third...is the categories of a value-institutional or phase analysis". From his analysis the author concludes that "system analysis clearly is not a panacea. Its greatest immediate contribution may be bringing to bear on socio-economic problems a tough-minded, pragmatic rationality, an emphasis upon rigorous, precise analysis, and the perspectives of a fresh, integrated viewpoint". "On balance...continued experimentation with system analysis is in the public interest".

63. Kramer, J. R., "Criminal Justice R&D: New Agency Stresses Police Over Corrections", Science, v. 166, no. 3905, 31 October 1969, pp. 588-590.

The activities, programs, and problems of the Law Enforcement Assistance Administration (LEAA) are reviewed and discussed. LEAA, a Justice Department agency was set up in 1968 to fund "innovative projects by state and local criminal justice agencies. The LEAA was given an R&D arm, the National Institute of Law Enforcement and Criminal Justice, responsible for doling out research funds". Although the overall criminal justice system consists of three parts - police, courts, and corrections - more than half of the Institute's budget goes "for Detection and Apprehension Development, which consists largely of developing better police hardware and techniques, better alarms, and better crimeproofing of cities". Relatively little attention is directed to the courts or to correction and

rehabilitation. Among the problems and issues discussed are the distribution of R&D grants (block grants to states vs. discretionary funding), cooperative efforts between researchers and police, the scarcity of qualified researchers, and the difficulty of getting "the hundreds of local and state organizations" to use the R&D results.

64. "The Federal Program in Population Research", Report to the Federal Council for Science and Technology, prepared by Ad Hoc Group on Population Research, Executive Office of the President, Office of Science and Technology, 1 July 1969, 115 pp.

This report is essentially an inventory of ongoing population research funded by the federal government. Research projects are cited, with funding information and agency sponsorship, under the following areas within population research: reproductive biology; fertility regulation, techniques and materials; descriptions of population size, distribution, characteristics and trends; determinants of population size, distribution, characteristics and trends; consequences of population size, distribution, characteristics and trends; research on operational aspects of population programs. The interests and activities of each federal agency conducting population research are also described. Agencies involved in the population area include Agency for International Development; Department of Health, Education, and Welfare; Department of Housing and Urban Development; National Science Foundation; Bureau of the Census, Department of Commerce; and Office of Economic Opportunity. The Ad Hoc Group recommends the establishment within the Executive Branch of a Standing Committee on Population Research and outlines the functions such a committee would perform.

(For sale by the U.S. Government Printing Office, Washington, D.C. 20402, Price: $1.25.)

65. Resources and Man, A Study and Recommendations by the Committee on Resources and Man, National Academy of Sciences, San Francisco: W. H. Freeman and Company, 1969, 258 pp. ($2.95).

This book is the offical report of the Committee on Resources and Man, established in 1966 by the National Academy of Sciences "to evaluate national and world resources in the light of current and expected stresses and to identify problems in need of study as well as opportunities for progress". The basic conclusion of the committee is that population control and better resource management are mandatory and must be effected without delay. Twenty-six specific recommendations are given as initial steps. The eight chapters of the report cover the ecology and geography of resources in relation to man, demographic trends, and the adequacy of food, mineral, and energy resources to meet current and

future needs. The chapters are "The Human Ecosystem" by Marston Bates, "Interactions between Man and his Resources" by John D. Chapman, "United States and World Populations" by Nathan Keyfitz, "Food from the Land" by Sterling B. Hendricks, "Food from the Sea" by William E. Ricker, "Mineral Resources from the Land" by Thomas S. Lovering, "Mineral Resources from the Sea" by Preston Cloud, and "Energy Resources" by M. King Hubbert.

66. "Bills for the Environment", Industrial Research, v. 11, no. 11, November 1969, pp. 32-33.

The major Congressional bills for environmental quality control are briefly described and compared, and related to the Administration's activities in the area. After citing the latter, it is pointed out that "Congress... shows no sign of backing off and letting the President have his own way in the matter". Evidence for this view is indicated by the several pending Congressional bills, some of which are described, in terms of their provisions and legislative status. These include Senator Jackson's bill (S. 1075) for the "National Environmental Policy Act of 1969", Senator Muskie's bill (S. 7) for the "Water Quality Improvement Act of 1969", Rep. Dingell's bill (H.R. 12549) which is similar to that of Senator Jackson's, and Rep. Daddario's compromise bill (H.R. 13272). "There seems to be general agreement that some sort of Congressional action is necessary to at least supplement" the Administration's actions in the environmental quality area. "The precise form it will take still is anybody's guess".

67. "Emotion, Politics Fog Pollution Problems", Chemical and Engineering News, v. 47, no. 46, 3 November 1969, pp. 24-26.

"The dilemma facing our country is how to resolve the economically and technically based approaches to cleaning up the environment with the more emotionally motivated and politically inspired calls for action now". This dilemma, according to the article, was underscored by the economic and technical concerns expressed by industry and pollution control agencies attending the Interior Department's National Executives' Conference on Water Pollution Abatement, which contrasts with the "mounting public concern and a Congressional clamor to climb on the environmental bandwagon". Industry and local pollution control agencies do not "dispute the need for greater pollution-curbing efforts", but many do question several issues: the pace of abatement controls set by federal and other agencies; certain standards that inhibit industrial development; the cost to achieve improvements in relationship to the benefits derived; and "how that cost is ultimately paid".

An approach to these and related issues was proposed at the conference to shape 'an appropriate national policy to solve the pollution problem'. R&D, it was noted, is only part of the answer; beyond this "lie the public and social judgments of cost and priority where the Federal Government has a primary and basic role to play in measuring the public's wishes, and shaping an appropriate national policy".

68. "Solid Waste Management, A Comprehensive Assessment of Solid Waste Problems, Practices, and Needs", Prepared by Ad Hoc Group for the Office of Science and Technology, Executive Office of the President, May 1969, 111 pp.

This report presents a comprehensive review of current solid waste disposal technology and recommendations for an expanded program of research, development, and demonstration on the part of federal agencies. The solid waste problem is described and details of types and quantities of wastes are given for each major source category: urban, industrial, agricultural, mineral, and Federal establishments. Three categories of high priority R&D are suggested: "projects directed toward new, improved, and publicly visible concepts of storage, collection and transportation; projects aimed at improving...esthetics and the efficacy of existing disposal systems; projects that reclaim from solid wastes readily marketable resources or usable energy". Specific recommendations include a broadly expanded federal program in solid waste management; establishment of educational programs at universities for engineers, public administrators, and others confronted with solid waste management problems; designation of a federal interagency group to establish goals, set priorities, and coordinate all federal solid waste activities; preparation of an annual report on the subject by the Department of HEW; and encouragement of private industry to develop and demonstrate new technologies to improve solid waste management.

(For sale by the U.S. Government Printing Office, Washington, D.C. 20402, Price: $1.25.)

69. "Air Pollution Agency's Sulfur-Oxides Abatement R&D Plan Under Review", News Report, National Academy of Sciences, National Research Council, National Academy of Engineering, v. XIX, no. 8, October 1969, pp. 1, 3.

"A five-year research-and-development plan intended by the National Air Pollution Control Administration (NAPCA) to lead to widely applicable methods for abatement of sulfur-oxides air pollution is undergoing detailed review by a National Research Council engineering panel. NAPCA requested the review through the National Academy of Engineering... after the House Government Operations Committee found the plan inadequate and incomplete and urged that it be submitted to outside public and private agencies for scrutiny. An Ad Hoc Panel on Control of SO_2 from stationary Combustion

Sources, appointed by the NRC Committee on Air Quality Management...has begun its examination of the NAPCA plan in light of the House committee's findings. The House report...is based on a study by the Research and Technical Programs Subcommittee under chairmanship of Rep. Henry S. Reuss. Citing testimony by air-pollution authorities, engineers, and fuel and power economists, the report questions the adequacy and comprehensiveness of NAPCA's 'long needed and recently adopted' plan in relation to the problem". "The House report urges major shifts of emphasis in the sulfur-oxides R&D program, and calls for assignment of greater priority to coal-gasification". It also "challenged both the spending plans and research directions of the sulfur-oxides program".

70. "Government Testimony Defends Present Nuclear Power Controls", Chemical and Engineering News, v. 47, no. 48, 17 November 1969, p. 37.

Congressional hearings on environmental effects of nuclear power stations, and the ability of federal agencies to set and enforce radiation safety standards, are reviewed and discussed. Government officials appearing before the Joint Committee on Atomic Energy took the position that "[e]nvironmental pollution critics must not be allowed to stifle growth of the electric power industry"; they assured Congress that the "federal agencies charged with regulating the quality of the environment would be able to keep pollution by power plants within acceptable limits". "As Atomic Energy Commission chairman Glenn T. Seaborg expresses it, 'the benefits related to nuclear power will outweigh the risks involved by a factor far greater than most technologies can boast'". As for radiation standards, the Joint Committee expressed concern that the Federal Radiation Council (FRC) which sets safety standards is staffed by laymen instead of scientists. "Others have raised the question that FRC decisions might be based on politics as well as science".

71. "Harnessing the Power of the AEC", Industrial Research, v. 11, no. 12, December 1969, pp. 29-30.

The article describes the provisions of a Senate bill for assessing the environmental effects of underground nuclear explosions, and presents some Congressional testimony regarding the need for new assessment mechanisms. In previous Congressional hearings, Franklin A. Long of Cornell University pointed out that the Atomic Energy Commission is both the sponsoring and evaluating agency for nuclear technology: "Some way must be found to bring in groups that more broadly represent the interest and concerns of the general public". The referenced Senate bill (S-3042) is directed toward this problem. It "would create a 15-man

study commission of nuclear and ecological experts with no ties to the federal government" which would "review and assess the environmental effects of underground nuclear explosions". The commission, presumably, would take up such issues as the effects underground tests, "such as the one at Amchitka, have on the earth's crust", or "on undersea ecology if...atomic explosions are harnessed to blast a new canal through the Isthmus of Panama".

72. "'Unconventional' Auto Research Proposed", Washington Science Trends, v. XXIII, no. 8, 1 December 1969, p. 45.

"Cabinet officials have proposed to President Nixon a broad research and development program looking toward the possible development of 'unconventional' automobiles to lessen air pollution. The program, involving grants and contracts to nongovernmental organizations, was taken 'under advisement' by the President for possible inclusion in the Fiscal 1971 budget. At the same time, officials reported that the Department of Health, Education and Welfare expects to issue new 'interim standards' within about six months to control emissions from conventional automobiles. Industry spokesmen, at a White House briefing, expressed confidence that future anti-pollution goals could be met 'if we have enough time'. They said the major question is one of 'manufacturing feasibility'. Cabinet officials said in addition to setting new standards, there should also be increased efforts in the field of R&D on 'unconventional vehicles or unconventional motors'".

73. Doctors, S. I., The Role of Federal Agencies in Technology Transfer, The M.I.T. Press, Cambridge, Massachusetts, 1969, 230 pp. ($12.50).

This book discusses the federal role in technology transfer and relates this role to current agency policies on the preparation, evaluation, and dissemination of technical data for parties outside of the federal agencies and their contractors. The transfer process is viewed as a complex function of several interrelated variables: "1) the acquisition of the technology from federal laboratories and contractors, 2) the evaluation of reported information relative to the needs of the ultimate user, 3) the dissemination of the evaluated technology, 4) the legal and insitutional policies". The book consists of three parts: the first discusses "the framework of federal R&D spending, the value of technology produced under federal sponsorship for use by other sectors of the economy, the results of some recent research in the transfer of technology...and...present agency programs"; the second part is devoted to an analysis of the NASA Technology Utilization Program; and the third

part offers "a series of conclusions concerning this NASA program and its relevance for a truly experimental program in...federally sponsored technology transfer programs".

74. La Porte, T. R., "Technologies Transfer: A Context for Policy Considerations", Internal Working Paper No. 104, June 1969, University of California, Berkeley, 25 pp.

A conceptual context involving social and political dimensions is offered for examining the application of technology to social-urban problems. The author suggests some changes in organizational systems "resulting from increasingly technicized solutions to economic and political problems" and explores their implications for our political values and the organization of public affairs. These changes - increased capacity to control physical conditions, increased complexity within and among institutions, and increased uncertainty as to the results of action - and their consequences require a new perspective regarding technology and its use that goes beyond merely technical and economic considerations to include an interchange and mutual adaptation between technological and social institutions. In conclusion, the author proposes "a set of general criteria for assessing technology as applied to urban and national problems"; alternative technical solutions would be evaluated in terms of these criteria, which also would "be placed upon designers and technological advocates".

(The report can be obtained from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151, Price: $3.00.)

75. "State Technical Services: Reprieve or Oblivion", Industrial Research, v. 11, no. 12, December 1969, pp. 28-29.

The "much-maligned" State Technical Services Program operated by the Department of Commerce has received a vote of confidence in the form of a program evaluation report by Arthur D. Little Inc. The report's conclusion was that "the program is providing a useful and economic service in transferring technology which substantially benefits the nation". It suggested ways of making the program more effective, including concentration of federal and state efforts on those problem-solving services that yield maximum returns. The State Technical Services Act, passed in 1965, is a means "to promote commerce and encourage economic growth by supporting state and interstate programs to place the findings of science usefully in the hands of American enterprise". There is considerable "unevenness in the effectiveness of the efforts" from state to state, and Congress has considered discontinuing the program. "How well the Department of Commerce succeeds in making the State Technical Services Program more useful to industry could determine whether the program is extended beyond 1971".

III NEEDS AND ALLOCATION OF RESOURCES FOR SCIENCE

54. "National Patterns of R&D Resources: Funds and Manpower in the United States 1953-70", National Science Foundation, NSF 69-30, September 1969, 36 pp.

This report, the second in the series, presents data on the utilization of national technical resources (funds and scientific talent) among the various sectors of the economy. The data presented include separate transfer tables for basic research, applied research, and development; contributions of State and local agencies to R&D funding and performance; and estimates of the scientific and engineering manpower employed by each sector in carrying on its R&D activities. The findings show that total R&D expenditures for 1970 are expected to reach $27.2 billion, up from $20.4 billion in 1965 and $5.2 billion in 1953. "However, the 1965-70 average rate of growth in R&D spending was only 5.9 percent compared to the 1958-65 average of 9.4 percent". "The major reason for the decline in the growth rate has been the leveling off of all R&D spending by the Federal Government. This relative decrease is particularly obvious in applied research and development...and, to a lesser degree, in basic research".

(For sale by the U.S. Government Printing Office, Washington, D.C. 20402, Price 55 cents.)

55. "Research and Development in Industry, 1967", A Final Report on a Survey of R&D Funds, 1967, and R&D Scientists and Engineers, January 1968, Surveys of Science Resources Series, National Science Foundation, July 1969, 110 pp.

This report, the 13th in a series extending back to 1953, presents the results of the 1967 survey of industrial R&D, including detailed statistical charts concerning funds and distribution of funds for R&D. Some of the highlights of this report include: about 70% of U.S. R&D has been performed by the industrial sector; industrial firms spent $16.4 billion for R&D performance in 1967; federal agencies financed 51% of this total; DOD and NASA furnished 89% of the Federal funds to industry; companies spent $8.0 billion of their own funds for R&D in 1967; five product fields - guided missiles and spacecraft, communication equipment and electronics components, aircraft and parts, machinery, and chemicals - accounted for 70% of all industrial applied R&D spending. Specific topics covered in this report include: funds for R&D performance, company-financed R&D performance, basic research, applied R&D, employment of R&D scientists and engineers, geographic distribution of R&D funds.

(For sale by the U.S. Government Printing Office, Washington, D.C. 20402, Price: $1.00.)

56. "Scientific and Technical Personnel in the Federal Government, 1967", Surveys of Science Resources Series, National Science Foundation, June 1969, 40 pp.

This report, the sixth in a series, presents information about the scientific and technical personnel employed by the Federal Government in 1967, their occupations, employment by agencies, and detailed information on their work activities. Topics covered include trends in employment, distribution by occupation, distribution by agency, work activities of scientists and engineers, women in professional positions, salaries of professional personnel, and nonprofessional scientific and technical personnel. Highlights reported include: professional scientific and technical personnel in the Federal Government numbered 204,200 in October 1967, 5% more than in the previous year; the Department of Defense was the major government employer of such personnel; R&D functions were the primary work activities of 29% of all scientists and engineers; employment of women in such positions increased 8%; average salary was $12,600 for scientists and $13,800 for engineers.

(For sale by the U.S. Government Printing Office, Washington, D.C. 20402, Price 50 cents.)

57. Nelson, B., "A Surplus of Scientists? The Job Market Is Tightening", Science, v. 166, no. 3905, 31 October 1969, pp. 582-584.

"Is this country now producing more scientists than it can place in suitable scientific jobs?" This article examines the question in terms of present employment opportunities in several disciplines, with the conclusion that the job market is tightening in many fields. The fields most affected by the job shortage include physics, chemistry, psychology, biology (especially molecular biology, systematic biology, and comparative anatomy), and mathematics. Reasons cited for the tightening of the job market include: "severe cutbacks in the rate of growth of public support of R&D"; rapid increases in Ph.D. production; and "a lessening of willingness by corporations in hire scientists in certain areas". In line with this, the Bureau of the Budget has reduced federal grants for the training of scientists by about 25 percent for this fiscal year. To cope with this problem, the author recommends these measures: 1) every scientific discipline should begin to collect comprehensive data on the supply-demand situation; 2) scientists should begin to consider positions in community and junior colleges and in high schools as well as in industry; and 3) scientific groups should present "plans detailing how increased funding for science could help abate some of the social, environmental, and health problems of the nation".

58. "No Job Shortage for Scientists", Scientific Research, v. 4, no. 25, 8 December 1969, p. 13.

"Two current myths - the overproduction of Science PhDs and the 'flight from science'" were recently disputed by Charles E. Falk, planning director of the National Science Foundation. The Foundation will soon publish a study on the future need for scientists and engineers; on the basis of this study, Falk says "it looks as though we're going to use every one of them coming down the pipeline in the next 10 or 20 years". He added "There is no shortage of jobs for scientists, but the jobs themselves have changed". Scientists and engineers are being employed in consulting, administration, management, and government activities instead of in the traditional academic and research and development positions. With regard to the "myth" that young people are turning away from careers in science, Falk stated, "We can't see any sign of a flight from science yet. Some of the students who feel that science should relate to society don't understand that research that is not relevant now will have a major relevance 20 years from now".

59. Holcomb, R. W., "Astronomy: Tight Budget Gains Stranglehold on Radio Facilities", Science, v. 166, no. 3908, 27 November 1969, pp. 984-986.

The effects of recent legislative budget cuts on astronomical research are discussed. Optical astronomers have not been as hard hit as those in the area of radio astronomy. Radio astronomers "have been unable to obtain funds for facilities recommended 5 years ago and are beginning to fear that the momentum that has attracted talented researchers from engineering and physics into radio astronomy may soon be lost". All but one of the optical telescopes recommended by a National Academy of Sciences committee chaired by Albert Whitford are under construction, but none of the radio facilities recommended "has even been funded". Facilities for radio astronomy that have been proposed, and the types of research to which they might be directed, are discussed. American astronomers are fearful that their position in radio astronomy will be usurped by nations such as Holland, England, Germany, and Russia which are finding the funds for construction of radio telescopes.

60. "Health Groups to Fight NIH Cuts", Scientific Research, Volume 4, No. ?, 27 October 1969, p. 15.

"Voluntary health associations are banding together to fight budget cuts in biomedical research and health manpower training made by the Dept. of Health, Education & Welfare and mainly affecting the National Institutes of Health. The campaign began last month when 40 to 50 voluntary health

associations, led by the American Heart Association, the American Medical Association, and the American Cancer Society held an informal meeting in New York to discuss what should be done to restore budget cuts". "It was decided to hold another meeting" "to draw up a lobbying campaign in Washington". "Although the need for such a campaign was highlighted by the 5- and 10-percent cuts in NIH research grants announced last month, the voluntary health associations have been concerned about declining support for medical research over the past year or more".

IV. NATIONAL R&D PROGRAMS

58. Augenstein, B. W., "Policy Analysis in the National Space Program", Rand Corporation, July 1969, 100 pp.

The report reviews and assesses the goals and policy issues that shaped the course of the last decade in space and that are expected to influence space endeavors in the next decade. The author discusses general policy problems, the histories of NASA and DOD, the last decade's space program in the context of the guidelines of the 1958 Space Act, features of the next decade's space program and specific steps for analysis of problems in the space program. In terms of space policy issues which impact on R&D strategy, the author argues that there would be a net long-term advantage to a space program structured around several major mission-relevant developments rather than one which focuses on a single major mission, and that selection of a program emphasizing advanced development activities will also enhance the overall returns from the space program. With regard to direct economic returns from space activities, the author recommends studies which determine how best to enhance space applications that are operational, studies which help choose among the potential future applications in some order of priority, and studies which identify and relate both the user's requirements and the cost to meet those requirements.

(The report can be obtained from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151, Price: $3.00.)

59. "NASA Budget", Aviation Week & Space Technology, v. 91, no. 20, 17 November 1969, p. 27.

The Senate "approved a $3.71 billion Fiscal 1970 appropriation for the National Aeronautics and Space Administration. This is the total requested by the Nixon Administration and authorized by both houses....The $3.71 billion is $280 million below NASA's Fiscal 1969 funding". "These are the House-Senate differences that will be resolved in conference: The Senate approved $19.9 million more for research and development....The Senate restored $200,000 for housing at Cape Kennedy and $4.77 million for construction of a new aircraft noise reduction facility at Langley Research Center. These two items were eliminated from the Administration budget by the House".

60. "Problems on Earth Plague NASA", Chemical and Engineering News, v. 47, no. 49, 24 November 1969, pp. 38-39.

Problems, policy issues, and possible changes in NASA are discussed. "The public, Congress, and President Nixon's advisers are arguing restraint over launching another Apollo-like...program to send men to Mars. Congressmen are holding down the space agency's budget and questioning future programs. The press is making the public aware of the dispute between NASA scientists and engineers, and a growing string of resignations by scientists-administrators. With all these events happening, there's pressure to make changes. In fact...NASA may now have to stress the scientific benefits from manned missions, as against the aspects of national pride or technological spinoff". Other issues and possible changes include greater scientific representation in NASA management, reduction in the rate of space missions to allow more time for preparing scientific experiments and analyzing findings, and the lack of biomedical data regarding the effects of extended space travel.

61. "Space Program's Three Choices", Industrial Research, v. 11, no. 11, November 1969, p. 35.

Alternative plans for space exploration in the 1970's, recommended by President Nixon's Space Task Group, are reviewed and discussed. "Constrained by a Congress with a big Vietnam budget and under pressure to spend more on the nation's domestic ills, space scientists seem resigned to a target date of 1986 for the first manned mission to Mars". "In the meantime, NASA expects to proceed with a balanced manned-unmanned space program with emphasis shifting to unmanned spacecraft to probe Mars, Venus, Mercury, and Jupiter". One of the potential plans outlined by the Task Group calls for a "crash program", while two other plans "represent much lower and slower levels of accomplishment in all areas over the full period"; one of the latter plans "has no commitment to manned planetary exploration". The "median of the three potential programs" is expected to be selected by President Nixon; and timetable for its missions is presented.

62. Normyle, W. J., "Lengthy Flights by Man Debated", Aviation Week & Space Technology, v. 91, no. 22, 1 December 1969, pp. 77-78.

"Suggestion that long-duration manned space flights be deferred pending further analysis of suspected physiological problems is not being seriously considered by the National Aeronautics and Space Administration. The suggestion itself has uncovered a deep-rooted schism within NASA

itself, and between the Office of Manned Space Flight and some segments of the medical profession. Those opposing long-duration manned space flight plans maintain that not enough is known about man's ability to survive and function efficiently. Officials making plans argue that continued and more demanding space flights must follow spectacular successes such as the Apollo lunar missions". The debate, which dominated hearings by the House Subcommittee on Space Science and Applications, is highlighted in this article. Part of the criticism is directed toward the fact that NASA has canceled all further orbital flights in the Biosatellite program, in which animals were used for evaluative purposes. A primary unresolved question is "how much future astronauts will submit to the kind of heavy instrumentation and monitoring" which have been suggested as necessary for safe survival in long-duration orbital flight.

63. "A Program for a National Information System for Physics - 1970-1972", American Institute of Physics, August 1969, 57 pp. (plus appendices).

In 1968 the American Institute of Physics (AIP) initiated a two-year study entitled "Towards Development of a National Physics Information System". "This report is the preliminary result of that two-year study and represents the progress and conclusions...at the end of the first one and one-half years". The proposed system is "based on a computerized AIP Information Service which is designed to augment the element of selectivity of the present information system for user interests. It is proposed that the system be developed in discrete stages, each adding to the capabilities of the system at the prior stage". The first stage would produce services such as magnetic tape services, indexes for AIP journals, and a specialized bibliography series as well as establish a central computer file. The second stage would make possible services to more precisely defined user-interest groups in physics, a form of selective dissemination of information. The third stage would offer Information Center services, including on-line access to the computer. Requirements for, and the capability of AIP to implement the system starting in 1970, are documented.

(The report can be obtained from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151, Price: $3.00.)

V SCIENCE, EDUCATION, AND THE UNIVERSITY

55. "Federal Support to Universities and Colleges, Fiscal Year 1968", National Science Foundation, September 1969, 90 pp.

This report, prepared by the NSF for the Committee on Academic Science and Engineering, provides quantitative descriptions of Federal programs supporting various types of science activities at universities and colleges. Information is provided on types of support provided, distribution of Federal funds among geographic areas and institutions, and patterns of such support over a period of years. Detailed statistical tables summarizing the Federal obligations are included. Some of the summary facts cited include: total Federal support to institutions of higher education in fiscal 1968 was $3367 million, an increase of less than 2% over 1967; academic science obligations rose by $17 million to $2340 million, but declined in relation to total support; over 2100 universities and colleges received Federal support; the Department of Health, Education, and Welfare awarded $2212 million to universities and colleges - nearly twice as much as all other agencies combined.

(For sale by the U.S. Government Printing Office, Washington, D.C. 20402, Price: $1.00.)

56. "Catalog of Federal Laboratory-University Programs and Relationships", Report to the Federal Council for Science and Technology, Committee on Federal Laboratories, Executive Office of the President, Office of Science and Technology, August 1969, 76 pp.

This catalog systematically describes many of the cooperative programs that have been developed between federal scientific laboratories and academic institutions. Among the types of programs described are those dealing with education of laboratory employees, education of others (such as high school and college students), work-oriented activities, personnel interchange, equipment interchange, curriculum, use of television and other audio-visual aids. Each general type of program is described with a summary of objectives, benefits, authority, and methodology; a partial list of organizations that utilize each type of program, is included. The catalog is intended to serve as a reference for laboratories and universities interested in exploring the possibilities for joint programs for various purposes.

(For sale by the U.S. Covernment Printing Office, Washington, D.C. 20402, Price: 75 cents.)

57. "DOD Opens Labs to Universities", Scientific Research, v. 4, no. 24, 24 November 1969, p. 15.

"The Defense Department is opening up its 125 laboratories to university scientists - but not to industrial scientists - who want to use such specialized lab equipment as accelerators, electron microscopes, and nuclear reactors - on condition that the information developed be shared with the Department". Academic research done at the military labs must be of particular scientific merit, relate to a DOD research objective, or contribute to the training of research manpower, but need not be defense oriented. According to a Pentagon official, 'The intent of this new directive is to encourage, and give recognition to, the necessary relationship between the DOD and the universities'.

58. Steinhart, J. S. and Cherniack, S., "The Universities and Environmental Quality - Commitment to Problem Focused Education", A Report to the President's Environmental Quality Council, Executive Office of the President, Office of Science and Technology, September 1969, 72 pp.

This report is a study of some of the multidisciplinary university programs dealing with environmental problems; its aim was to "discover what kinds of programs have been tried, which ones have been successful, and how the federal government might encourage the promising efforts". The report calls for government assistance in the formation at colleges and universities of Schools of the Human Environment; their purpose would be problem-focused education and research directed toward "people's need and desire for satisfying life in pleasant surroundings". "Initially such a program would cost approximately twenty million dollars"; initial funding should "be done by an ad hoc group drawn from the interested mission agencies and the National Science Foundation" and should "operate under the policy guidance of the President's Environmental Quality Council". On the university side, the authors conclude that for interdisciplinary programs to be successful there must be substantial control of the faculty reward structure and freedom to be innovative in introducing course material, educational programs, work study programs, and curriculum requirements for degrees. Included as an appendix is a summary of a detailed study by Dr. D. E. Cunningham on Federal Administration and Support of University Interdisciplinary Research, which emphasizes past funding efforts in the area.

(For sale by the U.S. Government Printing Office, Washington, D.C. 20402, Price 70 cents.)

59. Drell, S. D., "University Programmes in Science and Public Policy", Science Policy News, v. 1, no. 3, November 1969, pp. 68-70.

This article describes new programs and courses that universities might offer to give students a better

understanding of the interaction of science and technology and public policy. The courses would be offered to three identifiable groups within the university: the general undergraduates, the advanced honors and graduate students, and university faculties and other citizens returning to the university. For undergraduates two courses are recommended: one in sciences or engineering, emphasizing the impact of science and technology on the public scene; and the other in the social sciences, focusing on the relations between science, technology, and public policy. Several approaches might be used: a case study approach examining one or more problems of public policy; a general survey approach describing science and technology as political and social forces; or a science policy course approach, focusing on past and present organization in the scientific disciplines and on science in government. For graduate students a seminar course would consider the three broad areas of identifying policy problems, of elaborating the decision-making chain, and of discussing the allocation of resources. For faculties and other citizens, it is recommended that centers for advanced study of science and public policy be encouraged and supported.

60. "The Invisible University: Postdoctoral Education in the United States", National Academy of Sciences, Washington, D.C., 1969, 310 pp.

This report of the National Research Council's Office of Scientific Personnel takes a comprehensive look at "postdoctoral study as it exists in the United States today". Major sections of the report treat topics such as the history of postdoctoral research, demography of postdoctoral education, the foreign postdoctoral, financing, and the implications for the postdoctoral, academic and nonacademic institutions. Major conclusions of the study were: "in fields like physics, chemistry, modern biology...and medicine, postdoctoral education is virtually a necessity for subsequent employment in a highly research-oriented university"; the criterion for embarking on postdoctoral activities in any field should be "whether only by postdoctoral study can the PhD recipient be expected to perform independent research"; postdoctoral education "is a useful and basically healthy development" but "current practices can be improved and...changes in attitudes and policies are desirable". Recommendations include: 1) postdoctorals should be limited to those "in the process of development"; 2) duration of appointments and opportunities to teach should be determined in each individual case; 3) current restrictions should be removed to allow postdoctoral fellows to choose mentors at industrial research laboratories" as well as at universities; 4) "support for senior and intermediate postdoctoral opportunities should be increased

in all fields"; and 5) foreign postdoctorals should be welcomed and travel of American postdoctorals abroad should be encouraged.

(This book is available from the National Research Council, Printing and Publishing Office, 2101 Constitution Avenue, N.W., Washington, D.C. 20418, Price $10.00.)

61. Walsh, J., "Medical Schools: At the Center, the Problem is Unreimbursed Costs", Science, v. 166, no. 3906, 7 November 1969, pp. 726-728.

Recent cuts in National Institutes of Health support for biomedical research has had negative effects on both medical education and patient care in teaching hospitals. It is expected that the supply of high-quality faculty for medical schools will be reduced and that the academic medical centers will face severe financial crises. The sources of increased costs at university hospitals are explored: medical innovations, expensive drugs and diagnostic tests, increased wages for supportive staff, and insufficient Medicare and Medicaid payments have all added to hospital costs. Funds from NIH have contributed in the past to reimbursing some of these costs and the recent cuts in research and training grants have alarmed medical schools across the country. According to the author, "a grand strategy to meet the health crisis", not piecemeal first aid, is called for.

62. "The Draft Versus the Colleges", Technology Review, v. 72, no. 1, October/November 1969, p. 71.

"Current draft regulations are having a devastating effect on the supply of top level scientific and engineering manpower from the nation's graduate schools. According to a letter from the Engineering Manpower Commission of the Engineers Joint Council to Lee A. DuBridge, Science Adviser to President Nixon, the current draft priorities result in 'the preferential induction of advanced students and recent graduates out of proportion to their percentage in the draft-liable population and in excess of the needs of the armed forces for skilled personnel'. The Commission recommends that graduate students in good standing be temporarily deferred until Congress has acted on the proposed legislation to select men at random from a prime age group. The plan would not permit deferments to be pyramided into total exemption but would correct the inequity of drafting the older graduate students first. In the alarming decline in graduate school enrollment, engineering and science students have been hit proportionally harder than those in other

graduate disciplines". "Many American males are being replaced in graduate schools by foreign nationals; one third of engineering enrollments are foreign students. These students cannot be expected to remain in the U.S. as a continuing source of manpower".

VI SCIENCE MANAGEMENT AND POLICY-MAKING BODIES

57. "The Behavioral and Social Sciences: Outlook and Needs", A Report by the Behavioral and Social Sciences Survey Committee, Prentice-Hall, Inc., 1969, 320 pp. ($7.95).

This report, prepared under the auspices of the Committee on Science and Public Policy (National Academy of Sciences) and the Committee on Problems and Policy (Social Science Research Council), "was undertaken to explain the behavioral and social sciences and to explore some of the ways these sciences could be developed and supported so that their potential usefulness to society can be realized. The survey is directed to two tasks: first, to assess the nature of the behavioral and social science enterprise in terms of its past growth, present size, and anticipated development; and second, to suggest ways in which these sciences might contribute both to basic understanding of human behavior and to effective social planning and policy-making". The topics covered in the 17 chapters of the book include "Federal Support of Research in the Behavioral and Social Sciences", "Assessing the State of Society", "Sciences of Behavior and the Problems of Society", and "The Potentials of Large-Scale Social Research". Major recommendations call for the development of "a system of social indicators", an "annual Social Report to the Nation", a "national data system designed for social scientific purposes", a "Graduate School of Applied Behavioral Science", and an annual increase of federal funding for basic and applied research of between 12-18 percent "to sustain the normal growth of the research enterprise over the next decade".

58. Mead, M., "Public Policy and Behavioral Science", Bulletin of the Atomic Scientists, v. 25, no. 10, December 1969, pp. 8-10.

Conditions for and obstacles to contributions of the behavioral sciences to national and international affairs are reviewed and discussed. Mead cites several areas in which the behavioral sciences were used successfully during and shortly after WW II, but notes that "there has been a steady deterioration" in their use since then. This is attributed both to the behavioral sciences themselves (e.g., fragmentation instead of team work), and to the "proliferation of military and security regulations". Several conditions are cited as necessary for the behavioral sciences to contribute to the solution of public problems: interdisciplinary efforts, "competent members of the disciplines

inside those governmental bodies" who are to use advice of behavioral scientists, "a climate of opinion...which will make it possible...to take the advice that is given", and involvement "with very current issues". "It is...axiomatic that behavioral science research must be unclassified, free from security regulations, and conducted in contexts free from the need for secrecy".

59. "A Study of Technology Assessment", Report of the Committee on Public Engineering Policy, National Academy of Engineering, July 1969, 208 pp.

The process of technology assessment is studied and illustrated in this report, which was prepared for the Committee on Science and Astronautics, House of Representatives. The study consists of three parts: a summary of findings and commentary about the concept and practice of technology assessment; an analysis of the methodology used in the study; and the experimental technology assessment. The first part deals with the concept of technology assessment, how assessments can be made more useful, and means for maximizing the benefits from assessments. The second part describes the methodology used in the study, analyzes the task force as a mechanism for performing the assessment, and examines the interaction of the methodology with the organizational mode used. The third part presents assessments of three "technologies": "Technology of Teaching Aids", "Subsonic Aircraft Noise", and "Multiphasic Health Screening". (A companion report, "Technology: Process of Assessment and Choice", was prepared by the National Academy of Sciences. See Science Policy Bulletin, v. 2, no. 4, August 1969, p. 29.)

(For sale from the U.S. Government Printing Office, Washington, D.C. 20402, Price: $1.25.)

60. "Technology: Its Values, Its Effects", Chemical and Engineering News, v. 47, no. 49, 24 November 1969, p. 18.

The possible role of the National Science Foundation (NSF) in technology assessment is outlined in this article. NSF's director, William D. McElroy testified in hearings before a subcommittee of the House Committee on Science and Astronautics that the Foundation "should be given an active part in any procedure which the subcommittee might eventually propose to evaluate the effects of technology". NSF, according to McElroy, could contribute in various ways: identification of 'the specific ways in which scientific research can contribute to efforts to cope with such... problems as environmental quality, urbanization, and transportation'; support of research to obtain "scientific information necessary for an evaluation of benefits versus risks"; and the actual assessment of "technologies which

might arise from new scientific research or which are growing too rapidly to have clearly observable effects as yet". To accomplish this, "NSF might contract with private industry, nonprofit organizations, and universities for technology assessments"; such a move, McElroy notes would be 'a significant departure in foundation activities'.

61. "Technology: Talk About Assessment", Chemical and Engineering News, v. 47, no. 53, 22 December 1969, p. 11.

In hearings on technology assessment before the House Subcommittee on Science, Research, and Development, Dr. Lee A. DuBridge, director of the Office of Science and Technology "urged that the Government take a pluralistic, decentralized approach and start with pilot projects to 'shake down' the mechanism for technology assessment". He "recommended that the National Science Foundation make 'major contributions' to a technology assessment program". "He stressed that in developing a mechanism to assess technology's impacts, it would be ironic to 'fall into the very trap the mechanism intends to eliminate. We must assure that we are designing a technology assessment rather than a technology arrestment mechanism'". He suggested that candidates for technology assessment in the biological sciences could be gene manipulation, organ transplants, and personality-affecting drugs, and in the physical sciences he suggested large computers, weather modification, and earth resource satellites. Technology assessment may also become important to the National Bureau of Standards, whose Director, Dr. Lewis Branscomb, "makes a strong case for the science of physical measurement and setting of standards to ensure technology's beneficial application".

62. Dobrov, G. M., "Criteria of Choice: A Complex Problem of the Science of Science", Selections From Voprosy Filosofii, no. 3, 16 June 1969, USSR (Joint Publications Research Service), pp. 18-31.

The author discusses factors in and approaches to the selection of areas for R&D. He describes characteristics of the accelerated pace of scientific progress, including the reduction of the time lag between laboratory research and mass production. He discusses four groups of choice criteria used in selecting and determining the relative significance of R&D areas: 1) forecast reliability criteria, which "are used to estimate the quality and level of development of hypotheses for the purpose of screening dubious or ill-founded proposals"; 2) technical and economic criteria of choice; 3) systems criteria, by which a new area of research is evaluated in terms of the degree of influence it may have on other sciences; 4) policy criteria, which are based on the "general social structure of society, its domestic and foreign policy", its national goals, and its science policy. Approaches, including estimation equations

are presented and discussed for each type of criteria. The author considers the "search for quantified" and "more objective criteria of choice for forecast variants" to be "one of the most pressing problems of the contemporary science of science".

(This report may be obtained from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151, using the order number JPRS 48238.)

63. Haslett, A. W., "Little Science Versus Big Science", Advancement of Science, v. 26, no. 127, September 1969, pp. 99-105.

Criteria and value judgments involved in selecting areas of "little" science and "big" science are analyzed and discussed through several examples. Criteria suggested and discussed for "the more expensive kinds of basic research include: 1) the prospect that new knowledge of a fundamental kind may be obtained; 2) that the area of research is such that there is more than an average prospect that long-term practical benefit will be obtained; 3) that a technique of observation is involved which, in itself, promises new additions to knowledge; 4) national prestige or interest; and 5) support of...'areas of excellence'". "Big" science, says the author, increasingly involves value judgments, and because of this the values underlying such endeavors must be carefully scrutinized. As for "little" science, he contends that it contributes most significantly to the solution of major scientific problems, and that it "is as important in the aggregate as 'big' science". Overall, the author appears to be making a case for the pursuit of "little" science, partly on the grounds that "growth points of the future must arise, almost by definition,from 'little' science".

64. Boffey, P. M., "NSF: McElroy Seeks to Impart Political Headway to Agency", Science, v. 166, no. 3904, 24 October 1969, pp. 481-485.

Plans, problems, and prospects for the National Science Foundation (NSF) are reviewed and discussed. NSF's new director, William D. McElroy, "is already talking of more than doubling the agency's budget and of making it the 'lead' agency for supporting basic research and scientific education in this country". As a first step toward these goals, McElroy intends to improve the political and public relations of NSF in an effort to "help persuade Congress to provide larger appropiations". NSF's growth toward these goals has been hampered in the past by several factors: "NSF lacks the powerful constituency that the mission agencies enjoy"; the research supported by NSF does not have an "obviously useful application; and it therefore has a harder time 'selling' its program to Congress"; "NSF has never found a congressional champion"; and "NSF has

shown little interest or talent for political affairs". Beyond this, the agency, "for the past few years, has given the impression of drifting" and of having "lost its creative zip". "At this point the prognosis for NSF is uncertain".

65. "A Peek Into NSF's Future", Scientific Research, v. 4, no. 22, 27 October 1969, pp. 13-14.

The National Science Foundation's near future plans - in respect to fiscal matters as well as education and research support - are briefly described. The Foundation is expected to seek "$680 million for fiscal 1971"; this is "to be the first step toward doubling the NSF budget to about $1 billion by 1972, a goal frequently mentioned by Presidential Science Adviser Lee DuBridge and NSF Director William D. McElroy". As for education, "McElroy thinks that science manpower will become critical in the solution of social problems, and he wants to plan new programs that will facilitate the transfer from the campus to a technical job at almost any point in the process of higher education. 'This is multiple-track education'". "In another development, an NSF group...has been assigned... to explore areas in social science where the Foundation can introduce new ideas". "Other undertakings that McElroy hopes to promote at the NSF...include radio astronomy, deep-sea drilling, information storage and retrieval, and a stepped-up sea-grant program".

66. "NSF Organization Undergoes Change", Scientific Research, v. 4, no. 24, 24 November 1969, p. 15.

"In line with the major structural changes in the National Science Foundation called for in the NSF reorganization bill passed last year, Foundation Director William McElroy has announced the areas of responsibility of five new assistant directors. There will be one assistant director each for institutional programs, education, research, national and international programs, and administration. The assistant directorships for administration and national and international programs are entirely new administrative units under which existing programs have been regrouped. The other three jobs involve more or less the same duties as those of the former associate directors for the same areas, although the new assistant directors will have more responsibility for decision making". "These administrative changes resulted in part from an in-depth study of the organization of the NSF commissioned by the Foundation and made by a task group headed by John Vinciguerra of the Atomic Energy Commission".

67. "NSF Eyed to Fund Project Cambridge", Scientific Research, v. 4, no. 25, 8 December 1969, p. 12.

> Support for the controversial Project Cambridge, involving the adaptation of a large-scale computing system to the behavioral sciences, may be switched from the Defense Department to the National Science Foundation (NSF). The project has been criticized because of its military funding and because data could be used to maintain surveillance over large population sectors at home or abroad. The DOD says it has no objection to the transfer but has received no official request. The NSF says it has reached the limit of programs it can take over from the DOD and if Project Cambridge is picked up, some other projects might have to be dropped. The Project, which was formulated by 50 Harvard and MIT behavioral scientists, is currently under way on the MIT campus. The MIT administration has approved the project but Harvard has not yet decided whether to co-sponsor it.

68. Nelson, B., "HEW Blacklisting Issue Ignites Again", Science, v. 166, no. 3903, 17 October 1969, p. 357.

> HEW's alleged practice of "excluding scientists from... advisory panels on the basis of security and suitability checks" is discussed, with regard to the reaction of the news media and the subsequent decision of HEW to examine its security procedures. "Previously, the HEW [Department of Health, Education, and Welfare] leadership had seemed to give little attention to complaints by scientists and scientific organizations on HEW's security practices". However, after its exposure in the public media, "HEW hastened to announce that it has appointed a committee to examine HEW's security procedures including the exclusion of scientists from its panels". "In view of the timing of HEW's announcement, it seemed as if the committee might well have been created primarily in response to the press attention". "HEW officials may now take the matter more seriously and may finally summon up the energy to reexamine this system".

69. "HEW's Indiscriminate Blacklist", Industrial Research, v. 11, no. 2, December 1969, p. 25.

> "'Blacklisting' of health scientists for Dept. of Health, Education & Welfare may have been formally halted, but the practice almost certainly will continue subrosa just as it has for many years". Although insisting "that such a thing as a blacklist never has existed", "HEW readily acknowledges that candidates for advisory panels...must continue to undergo government security investigations to determine their eligibility to serve". In that respect, HEW "seems unique

among science-oriented government or quasi-government non-defense organizations"; several agencies that do not require such checks are cited. Under HEW's procedures, several things might bar a scientist from an advisory panel: criminal conduct; "unresolved questions of loyalty"; "sexual perversion"; "being considered subject to coercion, sabotage, espionage, or treason". "A HEW in-house committee is studying the security procedures", but in the meantime, "pressures to alter the system have been mounting steadily among health scientists".

70. "Progress in Scientific and Technical Communications, 1968 Annual Report", Committee on Scientific and Technical Information of the Federal Council for Science and Technology, COSATI 69-5, 90 pp.

This, the sixth annual report of COSATI, describes the activities and programs of the Federal government in the scientific and technical information area. The main concerns of COSATI focus on the evolving scientific and technical information systems, the ability of Federal agencies to utilize such information effectively in carrying out their missions, the development of internationally compatible information systems, and the development and application of information-processing technology. The report describes activities in these areas undertaken by the Federal agencies involved in scientific and technical information, as well as the activities and accomplishments of various COSATI panels and task groups. In his preface to the report, the chairman of COSATI cites the following areas as needing future attention: a "rationalization of Government information services and national systems, the development of policies for better coordination of operational systems...fuller exploitation of information analysis centers...analysis of the emerging legal problems...and growth of substantive international information systems".

(For sale by the Clearinghouse for Federal Scientific and Technical Information, U.S. Department of Commerce, Springfield, Virginia 22151, Price: $3.00.)

71. "New Research Council Study to Weigh National Objectives for Physics", News Report, National Academy of Sciences, National Research Council, National Academy of Engineering, v. XIX, no. 8, October 1969, pp. 1-2.

"In 1965 a committee...appointed by the National Academy of Sciences and headed by George Pake of Washington University concluded the study, 'Physics: Survey and Outlook', a two-volume assessment of the health and status of physics in the United States. A new National Research Council committee, under the chairmanship of D. A. Bromley of Yale University, is preparing to examine what has happened in the field since the period covered by the Pake report and

what directions physics may take in 1970s". "Since the Pake report, the Division of Physical Sciences has noted, striking changes have occurred in American society, in funding for physics, in the student population in physics, and in many of the subfields of physics itself; the Pake report was prepared in a period of research expansion - in contrast to today's financial picture for physics, which poses serious problems for the scope and nature of national efforts in the field". The "prospective study will explore not only physics as a discipline, but also physics 'in its current national and social context', including such topics as cultural and educational significance, basic and applied physics, social and economic considerations, manpower and education, and patterns and levels of research and education funding".

VII SCIENCE, FOREIGN AFFAIRS, AND NATIONAL DEFENSE

40. Lonsdale, D. K., "Developing Nations and Scientific Responsibility", Bulletin of the Atomic Scientists, v. 25, no. 9, November 1969, pp. 27-28.

Disparities between developed and developing nations in science and technology, and means for helping to close the gap, are discussed. "For every 91 scientists, engineers and technicians in the 33 technically developed countries, there are only nine in the 84 developing countries of Asia, Africa and Latin America. For every $97 spent on [R&D] in those 33 countries, only $3 go to [R&D] in the 84 underprivileged communities". Faced with such shortages, developing countries should encourage "applied research that is closely related to local needs". Developed nations can help these countries attain influential scientific communities by: 1) "persuading the most able of their scientists to remain in, or return to, their own country"; 2) "giving them any assistance they may need in working out the syllabus or scheme of training most suited to their own educational system"; 3) "helping to provide that system with a really broad, sound base" from elementary school upwards; and 4) providing help for the establishment of scientific associations and academies. Suggestions offered for mitigating the "brain drain" include setting up advanced research in developing nations by the more advanced nations and initiating a system for reimbursing developing nations for scientists who emigrate.

41. Quinn, J. B., "Technology Transfer by Multinational Companies", Harvard Business Review, v. 47, no. 6, November-December 1969, pp. 147-161.

The importance of technology for economic growth, the role of multinational companies in transferring technology, and policies for enhancing the transfer are reviewed and discussed. "Only in the last few years has there been a growing awareness that it is largely the technological application of land, labor, capital, and education - and not their mere presence - which determines a nation's potential for economic growth"; an "investment made in a well-selected technological advance...can achieve vast multiplier effects of change and progress throughout the society". "By far the most important method of transferring industrial technology from advanced countries to developing countries is through the operations of multinational companies"; some of the ways, direct and indirect, in which this is done are described. Policies, both those for the multinational company and the host nation, for enhancing technology transfer are suggested; proposed policies for the host nation include:

admit companies on the basis of their potential technological contributions, and not exclusively on fiscal criteria"; use local resources for "the communications, transportation, and power networks that are essential to modern industry"; "eliminate barriers to industry-university relationships"; offer "incentives for training in specific disciplines"; and acquire foreign technology rather than develop it internally.

42. Greenberg, D. S., "DuBridge: Nixon's Science Aide Takes a Swing Through Europe", Science, v. 166, no. 3903, 17 October 1969, pp. 350-353.

President Nixon's science adviser, Lee A. DuBridge, traveled recently through France, Romania, Yugoslavia, Belgium, Britain, and the Netherlands "for the purpose of promoting the new era of European-American scientific and technical cooperation". While in France, DuBridge and the French Minister of Industrial and Scientific Development, Ortoli, decided "to increase exchanges in disciplines and technologies relating to environmental and urban problems". DuBridge's visit to Romania kindled hope that a Romanian-American scientific exchange program agreed to at the end of the Johnson administration will be reactivated. In Brussels, DuBridge visited NATO, which was recently designated by Nixon as a "promising focal point for dealing with environmental problems". NATO may also become involved in studies in motivation, disaster relief, highway safety, and oceanography. In London, DuBridge discussed the effect of declining federal support for science and said that he would like to see federal support increase to an annual growth level of about 10 to 12 percent over the next few years to make up for current deficits.

43. Richardson, J., "Franco-U.S. Exchanges Seem Amorphous", Science Journal, v. 5A, no. 6, December 1969, p. 7.

The autumn visit to France by President Nixon's chief scientific adviser, Dr. Lee DuBridge, was intended to broaden the base of scientific and technical cooperation between the two countries. Accompanying DuBridge were specialists in scientific standards, international technical exchange programs, and atomic energy. The status and possibilities for cooperative efforts in these areas are briefly discussed. The visit caused considerable speculation as to the extent to which U.S.-French nuclear cooperation might be enlarged, but no official information about such expansion was given. "Somewhat amorphous and unquantifiable as the American-French scientific swap may be, and especially coming at a time when the French are trying to trim the economy, the costs of this extensive exchange programme are difficult to pin down". "What does count, beyond the intrinsic intellectual worth, is the political value to both sides".

44. Hanessian, J. and Margolin, J. B., "Broadcast Satellites: Their Potential Use for Educational Purposes, and Their Relationship to International Understanding and Cooperation", Program of Policy Studies in Science and Technology, The George Washington University, Occasional Paper No. 3, July 1969, 19 pp.

This report describes the potential of satellite-borne television for education in developing nations and briefly considers some of the policy issues and options involved in such programs. The report starts with a review of the educational applications of communication satellites, their benefits, and the requirements for an effective system. This is followed by a discussion of the international considerations (political, economic, and idealogical obstacles) and the involvement of the United Nations in this area. As to policy matters, the authors suggest that consideration be given to developing "the most effective means of assisting these countries in participating in such programs"; in this connection, it is recommended that "policy alternatives must not be limited to narrow bilateral arrangements, but, rather that multilateral and regional forms of participation must also be explored". In addition, the "role of the U.N. and its specialized agencies can be an important one".

(This report is available from the Program of Policy Studies in Science and Technology, The George Washington University, Washington, D.C.)

45. Hamilton, A., "CBW: Nixon Initiative on Treaty Anticipates Congressional Critics", Science, v. 166, no. 3910, 5 December 1969, pp. 1249-1250.

The implications of President Nixon's submission of the Geneva Protocol of 1925, which bans chemical and biological warfare, for Senate ratification are discussed. It appears that the President's new policy on CBW will not "directly affect U.S. practices in Vietnam", where tear gas and chemical herbicides are currently being used. The U.S. does not consider their use governed by the Protocol. However, other adherents to the Protocol may interpret the use of such agents in Vietnam to be in violation. Congressional pressure for ratification - one-fourth of the House and Senate are cosponsors of resolutions for ratification - was a factor in the President's decision to submit the Protocol. The President's new CBW policy also includes "a total ban on biological warfare, even in retaliation" and the "elimination of stockpiles of biological weapons".

46. "A Billion-dollar Research Cut", Science News, v. 96, no. 24, 13 December 1969, p. 550.

The House has cut $5.3 billion from the $75.2 billion requested by the Defense Department (DOD) for fiscal year 1970. Of this overall cut, $1 billion will be taken from

the $8 billion R&D budget. "Research that cannot be justified by rigorous standards of relevance to national security will be the first to go", as a result of the Mansfield amendment. "This means that if any basic research program can't prove it has military relevance, it will be eliminated". One definite loss will be Project Themis, started in 1967 as part of a Government-wide effort to establish centers of research in universities and encouraging university researchers to submit proposals that DOD would fund. "The new cutbacks are expected to decimate the $30 million program and preclude any new research starts under it".

47. Hamilton, A., "Senate Puts Pinch on 'Pure' Science in Military Bill", Science, v. 166, no. 3908, 21 November 1969, p. 982.

The military procurement and research bill, passed 6 November by Congress, contained the following curtailments on Pentagon-backed research: 1) no funds were allocated for new programs under Project Themis (the DOD's attempt to sponsor research at universities); 2) the Pentagon's R&D budget was cut $926 million from $8.2 billion; 3) $10.5 million was cut from the budget for biological and new chemical warfare agents; and 4) $90 million was cut from various Defense agencies' and military departments' research programs. The cuts, sponsored by Senator Fulbright, together with the anti-military climate on campuses, prompted John F. Morse, director of the Commission on Federal Relations of the American Council on Education, to remark, "it is going to be a really difficult year in this whole area" of academic research. Other provisions of the bill and their implications are briefly discussed.

48. "Defense R&D: Seed of Scrutiny", Chemical & Engineering News, v. 47, no. 48, 17 November 1969, pp. 13-14.

The provision of the authorization bill for the Department of Defense (DOD) that is intended to curb DOD support of basic research is discussed. In explaining the provision, Senate Majority Leader Mansfield noted that it 'goes to the heart of an important and now controversial public issue. To what extent should the research of our university scientists have to depend on the Department of Defense?'. The provision provides that 'none of the funds authorized... may be used to carry out any research project...unless such project...has a direct and apparent relationship to a specific military function'. The provision aims 'more at preventing general investment-in-the-future kinds of research at universities, rather than buying research from university scientists'. As a goal, Mansfield suggests that DOD funding of academic research be reduced "to no more than 25% of that supported by NSF by the end of fiscal 1971". 'Such a goal

provides time...to decide whether to sustain the overall level of academic research by increasing funds for the National Science Foundation and other agencies, or as a matter of national policy to reduce the overall level'.

49. "Pentagon Promises to Observe Congressional Curbs on Research", Science, v. 166, no. 3911, 12 December 1969, pp. 1386-1387.

The Senate and the Pentagon have apparently "reached an understanding on enforcement of a congressional ban interpreted as being aimed primarily at ending Defense Department support of basic research in the universities". Senate Majority Leader Mansfield, who has been behind the effort to curb DOD support of basic research, read into the Congressional Record his exchange of correspondence with Defense Department Deputy Secretary David Packard in which Packard stated that the DOD would fund only research which has "a direct, apparent and clearly documented relationship to one or more specifically identified military functions or operations". Mansfield has made it clear that he would not accept a mere shifting of location of research projects. With the definition of "basic research" still in doubt, the dialogue may well continue. The article includes a reprint of Mansfield's statement, a letter from Mansfield to Melvin Laird (questioning the DOD's compliance with the law), and a letter from David Packard to Mansfield (assuring the DOD's compliance).

50. "Senate to Probe Industrial R&D Charges", Scientific Research, v. 4, no. 25, 25 December 1969, pp. 11-12.

Early next year the Senate Armed Forces Committee will begin a detailed study of a Defense Department research fund labeled "independent research and development". This fund covers the private R&D done by industrial firms under contract to the DOD that can be charged to overhead costs, even though the work may have no clear-cut relationship to military missions. Senator William Proxmire, who is behind the study, has long been critical of the fund (which amounts to about $550 million in FY 1970) because he says it enables private companies to get the government to pay for their nongovernment research. The hearings could lead to new methods of charging overhead, which could affect the amount of money available for independent industrial R&D. Another objective of the hearings will be to try to determine the exact amount of the fund for any given year, so far a difficult task because of the arbitrary methods of assigning costs and the secretiveness of the companies regarding their R&D programs. The methods used by DOD for allocating independent research funds are described and some proposed alternative formulas are discussed.

51. "AAAS Team Will Go to Vietnam", Scientific Research, v. 4, no. 23, 10 November 1969, p. 11.

> The American Association for the Advancement of Science (AAAS) is setting up a committee to make a detailed comprehensive study of the effects of defoliants in Vietnam. "The full committee, yet to be appointed, will explore ways and means of visiting Vietnam to get data at firsthand on the effects of defoliants". The ten-month delay between the Association's decision to conduct a study and its setting up of the committee, attributed by officials to difficulties in finding "the right people", has been criticized by Association members. "Although some AAAS members have expressed doubts about the feasibility of conducting a scientific research program in a war zone, the AAAS board is generally enthusiastic about the idea".

52. "International Space Exploration", Science, v. 166, no. 3910, 5 December 1969, p. 1247.

> "The Senate has adopted a resolution authorizing the Committee on Foreign Relations to study the possibilities for international cooperation and cost sharing of space exploration. The resolution, introduced by 13 senators including Goodell, Muskie, McGovern, McCarthy, and Mondale, spells out two possibilities to be studied: establishment of an international consortium for space missions (similar to Intelsat and Comsat); and utilization of the United Nations organization. Senator William Proxmire (D - Wis.), who introduced the resolution, said the benefits of space exploration are shared on an equal basis, so costs should be also".

VIII SCIENCE POLICY IN FOREIGN COUNTRIES

International

198. Greenberg, D. S., "Soviets, West Discuss 'Think Tank'", Science, v. 166, no. 3911, 12 December 1969, p. 1382.

Soviet and Western representatives have been holding secret discussions on the establishment of a large-scale, nongovernmental "think tank" to study common problems of industrial society. The proposed institute would be concerned with developing methodologies for dealing with problems such as pollution, transportation, housing, and education. Centrally involved in the discussions have been Herman Gvishiani, vice chairman of the Soviet State Committee for Science and Technology (and son-in-law of Soviet Premier Kosygin), and McGeorge Bundy, president of the Ford Foundation. Italian, French, British, and West German representatives have also participated. A location in Western Europe and a professional staff of 400 have been proposed. "Though a final decision is yet to be reached, it is reported that the discussions have been productive and that concrete action to set up the proposed institute might possibly come early next year." A possible complication is the Nixon Administration's interest in expanding NATO beyond military matters through the establishment of a "Committee on the Challenges of Modern Society" to study the same kinds of problems.

199. Chinn, H. I., "International Scientific Co-operation", Bulletin of the Atomic Scientists, v. 25, no. 9, November 1969, pp. 34-35, 47.

The many forms of international scientific cooperation "formal and informal; individual and institutional; governmental and non-governmental; bilateral and multilateral", are described and assessed, and suggestions for improvement of such cooperative efforts are offered. The author (Science Officer in International Scientific and Technological Affairs of the U.S. State Department) discusses these forms of cooperation as they are practiced by the U.S. with both advanced and developing nations. He cites several advantages, and pitfalls to be avoided, of increased collaboration between the U.S. and developing nations; in this connection, it is pointed out that with "the developing nations, our traditional response has been technical assistance rather than scientific cooperation". Emphasis is given to informal cooperation and the relatively new bilateral agreements of which several specific programs are

cited. The author concludes with a statement of the State Department's interests in cooperative efforts, and the related assistance that the Department can and does provide.

200. Nader, C. and Zahlan, A. B. (Eds.), "Science and Technology in Developing Nations", Cambridge University Press, 1969, 588 pp. ($16.00).

This book contains the proceedings of a conference, held at the American University of Beirut in December 1967, at which the problems and possibilities of planning the development and application of science and technology in emerging countries were discussed, with particular reference to the Arab World and Turkey. The three main topics covered by the conference, which focused on human and institutional requirements of scientific-technological growth, were (a) the nature of the linkage between science, technology and national goals, (b) the problems facing institutions of higher education and government in the Arab World and Turkey, (c) the kinds of support required in planning scientific and technological expansion, and cultural factors affecting such an expansion. Some 25 individual papers, plus associated discussions, are included in the book.

201. "Conference on the Application of Science and Technology to the Development of Asia, Part I: Conclusions and Recommendations, Part II: The Messages Addressed to the Conference", New Delhi, 9-20 August 1968, UNESCO, 10 June 1969, 36 pp. (Part I), 83 pp. (Part II).

The purpose of this UNESCO conference, the third in a series and attended by delegates from 25 countries, was "to consider action required to further the application of science and technology to the development of Asia". Topics covered by the conference include prerequisites for the application of science and technology to development, science education in Asia, science policy and national development planning, transfer of technology, and mechanisms for regional cooperation. Part I presents the conclusions and recommendations of the conference; recommended "priority areas for action" include: promotion of appreciation of science by the common man through techniques of mass media; improvement of science education and expansion of facilities at all levels; promotion of recruitment and training of middle-level technicians; development of agricultural education; development of information and documentation facilities; strengthening of scientific research and technological development; development of the human element of the national scientific and technological potential; formulation and implementation of a purposeful national science policy; and organization and promotion of international and regional cooperation. Part II includes the complete texts of the addresses delivered at the conference.

202. Zahlan, A. B., "The Acquisition of Scientific and Technological Capabilities by Arab Countries", Bulletin of the Atomic Scientists, v. 25, n. 9, November 1969, pp. 7-10.

The problems and needed reforms for upgrading science and technology in Arab countries are reviewed and discussed. Problems cited as besetting the development of Arab science and technology include: 1) government ignorance of the relationship between applied and basic science, resulting in neglect of both; 2) inadequate science education at all levels; 3) inability of scientists trained abroad to adjust to institutional and resource problems in Arab countries; and 4) failure of Arab scientists to act "as channels of communication for important technological breakthroughs between advanced countries and their communities". A major need of Arab nations is better quality college teaching. To achieve this, full-time (rather than part-time) faculties must be employed and supported; the teacher-student ratio must be decreased; library and laboratory facilities must be improved; and faculty members must be given occasions to meet and interact with other scientists. Implementation of these reforms is estimated to cost about $250 million a year.

203. Gueron, J., "The Lack of Scientific Planning in Europe", Bulletin of the Atomic Scientists, v. 25, no. 8, October 1969, pp. 10-14, 25.

The problems and prospects of multinational science in Europe are reviewed and suggestions are offered for retrieving it from the present "throes of crises". Referring mainly to CERN, EURATOM, ELDO, and ESRO, the author contends that "fractionalism, petty concepts of fair return and meaningless competition are leaving Europe far behind the United States in scientific research and development". To support this argument, data are presented to show that the "research purchasing power" is about the same in the U.S. as in Europe. Based on these and other considerations, the author suggests that "the techno-scientific policy of Europe, when it finally emerges, should emphasize the three essential ideas of expansion, of the best use of present infrastructure and of yield". Beyond this, a "clear policy decision is...indispensable in order to give fresh life to European scientific co-operation. And it is surely the European Community... that is in the best possible position to take the initiative". "We must now urge Brussels and the six community capitals to quickly revive the international scientific organizations, and to regroup them with the national ones of similar kinds into a single plan".

204. Teich, A. H., "International Laboratories and European Integration", Technology Review, v. 72, no. 2, December 1969, pp. 43, 45-47.

This article, based on the author's Ph.D.'s thesis, examines the attitudes of scientists employed at three international laboratories as they relate to "prospects for European integration and international scientific cooperation". After discussing the functions and "varying degrees of success" of the three laboratories - CERN, EURATOM-ISPRA, and ESTEC - the author summarizes the attitudes and opinions of the scientific staffs with respect to such factors as management and organization, assets and liabilities of international laboratories, internationalism and the political environment, and expansion of such joint activities in Europe. In comparison with European leaders in non-scientific fields, "scientists in these laboratories differ mainly in the intensity of their desire for closer integration and in the breadth of their consensus on the future shape of Europe". The author concludes that although such scientific and technological cooperation as represented by these laboratories is proposed and partly justified as a means of promoting political cohesion, "it is the fact that political cohesion is more a necessary precondition for technological collaboration than an outcome of it".

205. Polach, J. G., "Nuclear Power in Europe at the Crossroads", Bulletin of the Atomic Scientists, v. 25, no. 8, October 1969, pp. 15-18, 20.

The present status of nuclear power development in Europe (Eastern and Western) is reviewed and some of the policy issues involved in future developments are discussed. "The European share of installed nuclear power is shrinking"; there is a "growing apprehension about the value of national nuclear power programs, their scope and technological aspects". The leading industrial countries seem to avoid a definite commitment about the future course of their nuclear policies while reassessing the alternatives". In this context, "four main areas of conflicting yet closely interconnected issues" are identified and discussed: "(1) independent national versus imported technology... (2) the cost-benefit implications of such alternatives; (3) national, regional or international institutional infra-structure requisite for successful development and marketing of alternative reactor types; (4) control and access to uranium enrichment technology and fuels and other materials". The author concludes that although Europe has dominated world nuclear power developments up to now, the U.S. will pass Europe in "installed nuclear power capacity" by 1975.

206. Hawkes, N., "New Approach to European Collaboration", Science Journal, v. 5A, no. 5, November 1969, pp. 11, 13.

The concept of a European Research Council (ERC), and prospects for its formation, are discussed. The original plan, developed 18 months ago by Patrick Gordon Walker, then Britain's minister for education and science, envisaged a mechanism "to bring order to the mass of international exchanges, fellowships and conferences which already exist, as well as supporting research". The ERC would be administered by eminent European scientists and financed by contributions from member governments; under one scheme, contributions would be levied at 1 percent of the budget the governments now spends on science, which would raise about 5 million pounds if 15 European countries joined. Science administrators, suggests the author, are likely to find the idea for the council appealing, because various specific scientific organizations are proliferating and there is a need to prevent them from competing. As for its prospects, "the ERC is scarcely more than a concept, and discussions about it have been on an informal basis" so far, but further discussions and possibly decisions are expected during the first half of 1970.

207. "Is Euratom Saved?", Nature, v. 224, no. 5224, 13 December 1969, p. 1047.

"Resolutions passed by the European Economic Community's Council of Ministers of Science and Technology have at long last lifted Euratom off the floor, even if they have not put it back on its feet. For far too long now - since 1967 - Euratom has been...making do with research budgets approved on a twelve-month basis, and this year on a six-month basis, instead of the grand five year programmes which the organization has been accustomed to." "The resolution passed by the council fixes the 1970 budget at $53 million, with a continuation into 1971 on the understanding that, from 1970 onwards, the organization will promote wider cooperation throughout the community on advanced reactors. It also asks for a restructuring of the Euratom management so that it becomes a more effective machine for cooperation between member states. Other parts of the resolution allow the common research centre which is so far confined to nuclear activities to do non-nuclear work." "What seems to have inspired the ministers to release Euratom from the impasse are the signs of a new spirit of cooperation which arose out of the recent summit meeting of the community at The Hague." "It now remains to be seen what interpretation the community summit places on the resolutions".

208. "All Set for CERN Decision", Nature, v. 224, no. 5221, 22 November 1969, pp. 739-740.

"The decision by the French Government...to confirm its earlier commitment to the CERN 300 GeV accelerator makes it almost certain that the council of CERN will finally decide to go ahead with the project." "French participation had been cast in doubt by the decision of the British Government in 1967 not to participate. Now France joins Austria, Belgium, Italy, West Germany and Switzerland among those faithful to the accelerator." "If the 300 GeV project is ratified...the CERN council will have five sites to choose from, one in each of the participating countries except Switzerland. The accelerator is expected to take eight years to build at a cost of 1969 prices of 1,431 million Swiss Francs (about £140 million)." "The largest contributions will be from West Germany (36 per cent) and France (30 per cent)." "If, on the other hand, the CERN council fails to reach a decision next month, a further postponement would place the project so far behind the American 200 GeV accelerator at Batavia, Illinois, that it might even be reluctantly abandoned".

209. Stubbs, P., "Whither ESRO?", New Scientist, v. 44, no. 675, 13 November 1969, pp. 336-338.

A possible change in the role of the European Space Research Organization (ESRO) is discussed. ESRO's function heretofore has been one of providing a service - "suitable space hardware, coupled to appropriate tracking, data-acquisition and data-handling machinery - for the benefit of scientists interested in space phenomena". The author contends that the paycffs from the present type of work undertaken by ESRO - geophysical satellites - is not sufficient to justify continuing in that vein; NASA's facilities are available for such fundamental research. Other directions now being proposed for ESRO are the development and application of communication satellites for television and air traffic control for use especially over the Atlantic. "Discussions are also under way to try to decide on the long-term directions that scientific research is likely to take. Thus the outlook for the Organization, though very much in the balance at the moment, holds promise of more than the mere 'prestige with some science' that has dominated it hitherto".

210. "EMBO Runs Into British Opposition", Scientific Research, v. 4, no. 24, 24 November 1969, p. 17.

"British scientists appear to be turning thumbs down on participation in the European Molecular Biology Organization's proposed laboratory - a CERN-type lab intended to

bring together Europe's best molecular biologists in a bid to challenge U.S. leadership in this field." "Opponents of the lab scheme objected primarily to spending British funds on an international project at a time when there is hardly enough money to support British science at home." "Opponents also contended that the lab would actually discourage research in molecular biology at the universities of EMBO member nations." "A final criticism was that the lab's research program...is unoriginal and doesn't vary enough from work already being done in Britain and elsewhere." "The EMBO lab would cost about $10 million to build and equip, assuming that its site were donated by the host-nation's government, and about $8.5 million a year to run. Britain's share would be about $3 million for construction and about $1.5 million a year in operating costs".

Australia

211. "Continuing the Boom", Nature, v. 224, no. 5220, 15 November 1969, pp. 635-636.

Budget expansions and shifts in research within the Commonwealth Scientific and Industrial Research Organization of Australia are presented. "The total expenditure of the CSIRO in 1968-69 was $46.6 million, of which $42.9 million was spent on scientific investigations"; This represents an increase of $4.1 million over 1967-68. Areas receiving budget increases were plant industry (up $3.4 million), entomology, animal physiology, animal health, applied physics, food, soils, tropical pastures, land, and textile industry. Areas receiving cutbacks were applied chemistry, chemical physics, and chemical engineering. Recent and projected building projects include a microbiology unit, extension of the tropical pastures laboratory, agronomy laboratory, and a meteorological research center.

Austria

212. "Research Funds", Science Policy News, v. 1, no. 3, November 1969, p. 57.

"The [Austrian] Council of Ministers approved...the second supplementary budget, under which an additional S.83 million is to be appropriated for research and school and university construction and equipment. The individual items are as follows:

	Millions of S.		Millions of S.
Fund for the promotion of scientific research	20.0	Universities	15.0
Fund for the promotion of research in industry	20.0	Atomic research	4.0
Schools coming under the State system	19.3	Cultural institutes	2.1
		Scientific establishments	1.5
		Federal Homes, sports centres	1.1."

"Finance Minister Professor Dr. Stephen Koren pointed out that if research expenditure continued to increase at the same rate as in recent years it would be possible by 1975 for Austria to reach its ultimate goal of investing 1.5 per cent of its GNP in R and D".

Canada

213. Gunning, H. E., "Canadian Science Policy and the OECD Report: A Critical Analysis", Science Forum, v. 2, no. 6, December 1969, pp. 3-6.

The study of Canada's science policy, conducted by the Organization for Economic Cooperation and Development (OECD), is reviewed and discussed. The paper starts with an examination of the "political philosophy in which the recommendations" of the OECD study "are contextually embedded", and then discusses the major recommendations themselves. As for the first, the author sees the overall thrust of the study as a call to "carefully define our national goals and incorporate them into a broad national plan of action that will fully utilize the creative abilities of our scientists and engineers"; although the author agrees that "this is the general direction along which our society must progress", he points out that "there are problems in implementing such a comprehensive political strategy in a democratic society". Turning to the specific recommendation, Gunning reviews and comments on OECD's recommendations for university reform (e.g., greater social and economic relevance, more interdisciplinary research), greater government direction over university research, the creation of a single granting agency, involvement of scientists in policy making, and the appointment of a science minister as well as other organizational changes. As for reaction to the study, the author believes it "will spark a great deal of heated discussion among scientists" who "will not take kindly to the authoritarian philisophy underlying the...recommendations".

214. Hughes, E.O., "The Government Makes Its Response to the OECD Proposals", Science Forum, v. 2, no. 6, December 1969, pp. 7-10.

The Canadian government's response to the OECD's study of Canada's science policy is summarized. The confrontation

centered around three aspects of national science policy: (1) the place of science and technology in government institutions, (2) science policy and economic growth, and (3) science policy and the universities. With regard to suggestions for changes in the decision-making machinery for science policy, the government points out the "close resemblance between the existing science policy machinery and that proposed by the examiners". The OECD recommendation to establish a single comprehensive granting agency conflicts with a recommendation by the earlier MacDonald report; both suggestions are being considered. Concerning economic growth, discussion centered around the need for specialization in Canadian industry, the government's industrial incentive program that aims at overcoming the lack of entrepreneurship of Canadian industry, and the government's encouragement of multinational companies. With regard to universities, the following points were made: "up to the present, there has been no need at the federal level to exercise a choice between the financial requirements of education and research"; Canadian universities are now reviewing their involvement in research and determining its role in education; attempts are already being made to improve the relationship between universities and industries.

215. "Proceedings of the Special Committee on Science Policy", The Senate of Canada, First Session, Twenty-Eighth Parliament, Nos. 65-78 (June 1969), Queen's Printer and Controller of Stationery, Ottawa, Canada, 1969

These hearings, held in June 1969, are a continuation of the efforts of the Canadian Senate to study Canada's science policy, "with the object of appraising its priorities, its budget and its efficiency". The committee was established to inquire into and report on recent trends in R&D expenditures in Canada compared with those in other countries; R&D activities carried out by the government; federal assistance to R&D activities carried out by individuals, universities, industries, and others; and the broad principles, financial requirements, and structural organization of a "dynamic and efficient science policy for Canada". Presenting testimony and submitting briefs on the nation's science policy needs are representatives from industries, government agencies, and universities. These organizations include Canadian Standards Association, DuPont of Canada, Merck Frosst Laboratories, Gulf Oil Canada Limited, Northern Electric Company Limited, the de Havilland Aircraft of Canada Limited, Dominion Foundries and Steel, Quebec-Hydro-Electric Commission, Bell Canada, The Canadian Chemical Producers' Association, and the Royal Architectural Institute of Canada.

216. Lapcinte, C., "NASA-Type Institutions Are the Key to Tomorrow's Technology-Based Society", Science Forum, v. 2, no. 6, December 1969, pp. 26-27.

A strongly advocated case is made for NASA-type institutions, carrying precise mandates and clear objectives, to deal with urban-environment problems. "With a proper mandate, this type of institution can form [a] close link-up with the universities and use the production capability of private enterprise". Such institutions "can be promoted at the federal, regional or local level" to deal with problems such as air and water pollution, traffic congestion, and low-cost housing. Several advantages are cited for such mission-oriented institutions: increased "export potentials for Canada; alleviation of regional disparities in economic development; and absorption of technical personnel" whose limited opportunities force the brain drain. "At any rate, the policy of allocating R&D funds to a plethora of pseudo-industrial projects is obsolete. Only a mission-oriented approach remains effective...".

Cuba

217. Ryder, W. D., "How Cuba Manages Its Science", New Scientist, v. 44, no. 675, 13 November 1969, pp. 339, 341.

Science in Cuba - its organization, management, and dependence on foreign assistance - is described. "With the decision to aim for a science-based economy, the Cubans had to rely largely on foreign assistance". The article describes the various forms, sources (mainly East European nations especially the U.S.S.R., but also some western countries) and technical areas of assistance. The assistance includes both research and teaching; for example, over 250 foreign teachers are on the staffs of Cuba's three major universities. Organizationally, one of the key structures is the Academy of Sciences which was set up in 1962 and now embraces some 30 institutes, departments and working groups. In regard to management, a high "degree of Cubanization is insisted on right down to laboratory level in virtually all instances". "Courses of action are sometimes taken without consulting non-Cuban personnel" and there "are frequently unexplained and occasionally inexplicable switches from one topic of investigation to another". In spite of these factors, "Cuba is probably one of the most deserving recipients of foreign assistance".

Denmark

218. Greenberg, D. S., "Denmark: A Late But Hurrying Entry in Science Policy Planning", Science, v. 166, no. 3905, 31 October 1969, pp. 586-588.

The Danish government's attempts to coordinate policy planning for research, education, and industry are described. The Danish Science Advisory Council, the principal instrument for science policy, is producing a "statistical picture of the amount and location of total national expenditures for research and development", estimated to be about $150 million a year (about 1.2 percent of GNP). The Council's recent accomplishments include: (1) establishment, on Council recommendation, of five separate research councils (in humanities, and the natural, social, medical, and agricultural sciences) to replace a single organization for dispensing money for academic research, and for initiating research; and (2) recommendation to the government that there were greater national priorities than involvement in construction of the 300-GeV accelerator by CERN. Another policy planning body, the Academy of Technical Sciences, which operates or coordinates more than a score of research centers, is also described. Both organizations are likely to play a much larger role in Danish R&D in the future, and it is likely that some academic authority over research will be transferred to these bodies.

France

219. Greenberg, D. S., "De Gaulle, Research, and the Balance of Payments", Technology Review, v. 72, no. 2, December 1969, pp. 10-11

"Policymaking for French science and technology is currently descending from a 10-year Gaullist high - and henceforth the key words are supposed to be profit and utility, rather than grandeur and independence." The changes in France's science policy being introduced by the Pompidou government are reviewed and discussed. The author notes that although many fields of science and technology (e.g., space and nuclear research) prospered under De Gaulle, the overall effort "was poorly matched to the needs of French society". To enhance the match, the new government has already or plans to take several actions: merger of the Ministry of Science and the Ministry of Industry into a single organization known as the Ministry for Industrial and Scientific Development; reduction in atomic energy and space funding; and a substantial cutback in its contributions to the European Space Research Organization.

220. Chodkiewicz, M., "French Science Goes Through a 'Pause'", Science Journal, v. 5A, no. 6, December 1969, pp. 11, 13.

Budgets for research in France have been cut, resulting in reductions of professional promotion of scientists, recruitment of new staff, and renewal of contracts. Research workers have been protesting against "the smothering of research by the authorities". Those responsible for French science policy do not think that the present financial difficulties affect the effort started 10 years ago and emphasize that the measures included in the sixth plan (1970-1975) are independent of the present crisis. Among those measures are recommendations for facilitating mobility of research workers and for motivating industries to recruit University graduate scientists. The Institute for Industrial Development (IDI) has been formed to help sound businesses through difficult growing crisis by temporarily participating in their capital investment. IDI should be able to influence reorganization of certain sectors and to act as a catalyst in the merging of firms. In addition, a reform of state markets is being prepared including new procedures for awarding contracts. This industry-dominated strategy will be presented to Pariament by M. Ortoli, Minister for Industrial Development and Research.

221. "$85.14 Million French Space Budget Asked", Aviation Week & Space Technology, v. 91, no. 22, 1 December 1969, p. 23.

The French national space agency will announce a "bare bones 1970 space budget of $85.14 million". The lowest budget since 1966, it will provide minimum funding only for ongoing programs. The most severe reduction is the allotment for the European Space Research Organization (ESRO), reduced from $12 million to $4.14 million. In addition to the present financial problems in France, several factors have caused this overall reduction: The French space agency feels the ESRO laboratories have too much autonomy and that they are stressing science at the expense of applications. Lack of funds has forced France to eliminate 15 of 20 cooperative programs with Russia and to reduce the number of satellites to be launched during 1971-75. With regard to ELDO (European Launcher Development Organization), France's 1970 contribution will total $15.66 million as compared to $20 million in 1969.

Italy

222. "Science Policy in Italy", OECD Observer, no. 42, October 1969, pp. 27-31.

The patterns and policies of government-funded R&D in Italy are described in this article. Included are data on R&D

expenditures by sector and type of research, descriptions of the funding and performing institutions, and projected reforms of the R&D system. Although R&D expenditures are still only a small fraction of Italy's GNP, research appropriations are expected to increase by almost 70 percent during the period 1966-70. Fundamental research is generally centered in the physical sciences, while applied research focuses on nuclear energy and space. The organization and performance of the major research institutions - universities, the National Research Council, and the National Council for Nuclear Energy - are described and briefly discussed, as well as Italy's heavy involvement in international cooperative programs. Projected reforms of the system include integration of research activities and faculties of universities, "introduction of several degree levels", and greater coordination of research. Overall, the "organisation of scientific research in Italy is...in a transitional phase pending the reforms which will rationalise it and...allow a genuine science policy to emerge".

Japan

223. Long, T. D., "Policy and Politics in Japanese Science", Minerva, v. VII, no. 3, pp. 426-453.

This descriptive critique of Japanese science policy reviews the scale of Japan's R&D, examines industrial research, discusses higher education and research, analyzes the science policy-making apparatus, and describes the "politics of science" (the political context of science and policy). Among the several conclusions of the author are the following: "The organisational machinery for the formulation and execution of science policy in Japan is at least as advanced as it is in certain of the other leading countries". "But whether this machinery is adequate for assessing progress, analyzing needs, establishing priorities and allocating resources is another matter"; "Japanese scientists are not a central force in the making of decisions in science policy. As a result the bureaucracy...has gained control of science policy which it conducts in accordance with adminstrative requirements and out of the public view". Japanese scientists and engineers, the author believes, must "achieve greater influence over the making of policy. But even more important, Japanese policy makers must begin to think of themselves as dispensers as well as absorbers of knowledge and skills".

Norway

224. "Recommendations for a Norwegian Research Policy", Minerva, v. VII, no. 3, Spring 1969, pp. 465-489.

The science policy recommendations of the Central Committee for Norwegian Research are reproduced here in an abridged form. The report presents data on resources (human and financial) devoted to research, describes the organizational patterns of Norwegian research, and discusses university, governmental, and industrial research problems and needs. Recommendations of the Committee include expansion of the research budgets and greater flexibility in their use; assignment of responsibility within each ministry for "objectives, priority-ratings and the financing of applied research within the sphere of interest of the ministry"; increased research in industry, encouraged by government subsidies; and the establishment of "bodies to work as intermediaries for contract research at all...academic institutions". Under "aims and means for a Norwegian Research Policy", the report discusses the objectives of basic and applied research in the Norwegian context, the needs and criteria for setting research priorities, the supply of scientific manpower, needed changes in the organization of research, and reforms in the patterns of research financing.

Turkey

225. Moonman, E., "Turkey Plans for Economic Growth", Science Journal, v. 5A, no. 5, November 1969, pp. 9, 11.

The problems Turkey must overcome to acquire economic independence are discussed with emphasis on the roles of government, industry, and the universities. Though university professors and some politicians are eager to expand R&D, some conditions in Turkey may mitigate against an independent technological course. These conditions include (1) a precarious economy in which imports greatly exceed exports, (2) a bias against agricultural development, (3) failure of industry and government to utilize scientists or technologists in key policy positions, (4) weak marketing and management in established industry, and (5) emphasis on fundamental research at universities and bias against applied or industrial-sponsored research. To achieve technological success, Turkey must: (1) be more willing to collaborate, either with other nations, among Turkish industries, or among universities and industries, in sharing R&D costs and knowhow; and (2) be willing to use appropriate techniques that may have been evolved elsewhere but are applicable to local conditions.

United Kingdom

226. "Tight Budgets Ahead", Nature, v. 224, no. 5224, 13 December 1969, pp. 1042-1044.

Public expenditures expected for science, technology and higher education up to 1974 are presented and discussed. "For the research councils, the British Government estimates that growth will continue in the two years ahead, until the spending...amounts to £111 million"; this represents an average growth rate of 7.2 per cent a year. Funding "will then be unchanged at the rate of £115 million a year". Within the councils, greatest growth is expected in the Social Sciences Research Council and the Natural Environment Research Council. In technology, an overall decrease, rising in 1973-74 to about 15 per cent less than at present, is expected in R&D support, although direct support for industrial technology is expected to rise. As for higher education, the universities "will fare worse than most other sectors of the educational system"; expenditures are expected "to increase by only 15 per cent in the three years from 1968 to 1972". Although "the proportion of each age group going on to some form of higher education will have increased from 14 per cent to something like 20 per cent...[t]here is no sign of a matching increase in expenditure on higher education".

227. Mencher, A. G., "Making Technology Pay: A British Dilemma", Technology Review, v. 72, no. 1, October/November 1969, pp. 12-13.

The efforts and problems of the U.K. in making science and technology pay off economically are reviewed. "Britian's biggest technological dilemma is not technological. It is the insufficient development of the innovative process, that long and tortuous path leading an idea, an invention or a discovery from conception to the market place. This process is intimately affected by tax policy; by management skills and attitudes; by social structure and attitudes; and by the relations of labor with government and with industry. All of these interacting topics are currently the subject of intense debate in Britain". Efforts and programs to increase the economic return from science and technology are summarized; one of the most successful of these, according to the author, is the National Research Development Corporation which provides funds "to help good ideas, inventions and discoveries evalue into viable products". The brain drain and "the ascendency of American industry in Western Europe" are cited as the "most controversial technological issues confronting the U.S. with Britain".

228. "Running With the Tide", Nature, v. 224, no. 5217, 25 October 1969, pp. 297-298.

This article reviews and comments on the annual report of the Science Research Council for 1968-69. "Plainly the council...wishes to use its endowment [£42 million in 1968-69], not merely for the support of long-term research but also to influence the direction of university development". Towards these ends, the council presents a new policy of 'selectivity and concentration' in setting priorities for research support, fixes "the award of post-graduate studentship...at sixteen percent of the numbers graduating in science and engineering", and creates separate award boards for science and engineering. Commenting on these policies, the author points out the danger of selecting fields for support "in which universities have very little to contribute". He questions the council's right to "keep constant the proportion of people who stay on after their first degree", and suggests that the policy "may be a short-sighted measure". In respect to the separation of the board, the author argues that this "will create opposing vested interests out of science and technology, in the process perpetuating the foolish polarization which has grown up in the past few years".

229. "New Enquiries", Nature, v. 224, no. 5222, 29 November 1969, p. 841.

The Select Committee on Science and Technology will study the problems of population growth in the United Kingdom, while the Select Committee on Education and Science will consider teacher training. The Select Committee on Science and Technology also has announced that it will be looking into an aspect of the computer industry and into atmospheric and river pollution; in addition, it has appointed two subcommittees to resume examination of the UK space research programme and to study recent developments in carbon fibre technology. The inquiries into the computer industry and the space research programme will probably involve examination of the prospects for European cooperation, and the carbon fibre inquiry will probably be dominated by a recent decision of the Imperial Chemical Industries not to produce the material. Membership of the Select Committee on Science and Technology is presented.

230. "Shoe Pinches the Physics", Nature, v. 224, no. 5221, 29 November 1969, p. 838.

"The Physics Committee of the Science Research Council, responsible for dispensing roughly 1 million pounds a year on physics research in British universities and institutes, has produced a modest echo of the complaint elsewhere that other sources of support 'for good fundamental work' have

diminished." Solid state physics and plasma physics have suffered most from this reduced support at a time when the importance of these fields is growing. The committee has published a review of its current fields of interest and of the directions in which its work may develop. The committee intends to emphasize neutron beam research, synchrotron radiation in the study of gases and solids, ion implantation studies in semiconductors, and the study of the amorphous state. It hopes to encourage the use of on-line computers to improve laboratory facilities and to foster cooperative research and training between universities and industry.

West Germany

231. "Leussink to Run German Science", Scientific Research, v. 4, no. 24, 24 November 1969, p. 15.

"In a move to bring about needed reforms in both science and higher education, West Germany's Chancellor Willy Brandt enlarged the former Ministry for Scientific Research to include higher education last month and named a soils engineer, Hans Leussink, to head the new Ministry of Education & Science." "The nonpartisan Leussink had been chairman of West Germany's prestigious federal- and state-sponsored Science Council, where he was instrumental in launching a program last year designed to streamline university research." "It is unclear...whether the Brandt regime will increase the science spending planned by the previous government. Those plans were designed to bring expenditures for German research and development up to 3 percent of the gross national product by 1972. The science budget for the Ministry of Education & Science is nearly $545 million this year. The projections of the previous West German Government called for that figure to be raised to $1 billion by 1972".

232. "First All-German Satellite", Nature, v. 224, no. 5219, 8 November 1969, pp. 523-524.

This brief article announces the launching of West Germany's first satellite and describes the country's national and international space efforts and plans. "A symbol of West Germany's burgeoning space programme, the satellite is the final phase of an agreement between NASA and the German Ministry for Scientific Research which was signed in 1965"; there "has been no exchange of funds between the two nations - NASA has provided the sounding rockets and the... launcher free". "Although Germany's contribution to the European space programme is expected to remain more or less steady at about DM 150 million into the 1970s, there

is an enlargement of the national programme." "Depending on what projects are chosen, the national programme in 1971 could be either twice or two-and-a-half times the contribution to Europe. The latest satellite...comes under the national programme".